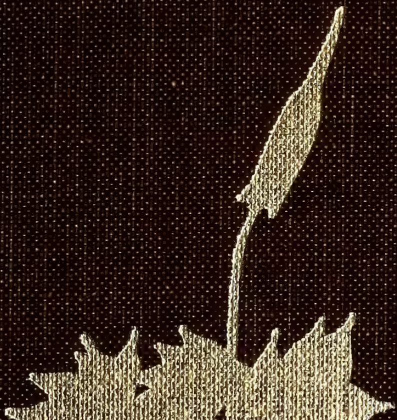
Robert R. Ireland

Moss Flora of the Maritime Provinces



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MOSS FLORA OF THE MARITIME PROVINCES

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To the friendly people of the Maritimes.

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Abstract

This manual treats the moss flora of the Maritime Provinces of Canada, namely New Brunswick, Nova Scotia, and Prince Edward Island. The three provinces lie in eastern North America, between approximately 43–48°N, 60–69°W, and are situated predominately in the Acadian Forest Region. The manual recognizes 381 species, 19 varieties and one form in 135 genera and 43 families.

The treatise includes introductory information on structure and life cycle of a moss, collecting and herbarium techniques, collectors of Maritime mosses, identification and methods of study, reference books, and nomenclature and classification. Keys are provided for the genera and species. Each genus is fully described, while the species are briefly described, followed by information on habitat, Maritime distribution, range, chromosome number, and relevant remarks. A full plate of black-and-white illustrations is provided for most of the species. A fully illustrated glossary is presented at the back of the book.

Résumé

Ce guide traite des mousses des provinces Maritimes du Canada: Nouveau-Brunswick, Nouvelle-Écosse et Île-du-Prince-Édouard, qui se trouvent dans l'est de l'Amérique du Nord, entre les 43^e et 48^e parallèles nord et les 60^e et 69^e méridiens ouest. Cette région appartient principalement à la région phytogéographique de la Forêt acadienne. Dans ce guide on reconnait 381 espèces, 19 variétés et 1 forme, réparties entre 135 genres appartenant à 43 familles.

Ce guide comprend des informations générales sur la structure et le cycle vital des mousses, les techniques d'herborisation et de conservation, les collectionneurs de mousses dans les Maritimes, les méthodes d'identification et d'étude, les ouvrages de référence, la nomenclature et la classification. On y donne les clés des genres et des espèces. Les genres font l'objet d'une description complète et les espèces, d'une description sommaire, suivies de données sur l'habitat, la répartition dans les Maritimes, la distribution générale, le nombre de chromosomes et d'autres remarques pertinentes. La plupart des espèces sont illustrées sur planche en noir et blanc. Un glossaire illustré complet termine le livre.

Acknowledgements

Many persons have assisted in the completion of this study which started in 1967 and I owe them all my gratitude and special tribute. My wife, Ellen, and my sons, Edward and Joseph, assisted with the field work and helped make that aspect of the project extremely enjoyable and successful. Linda Ley, Curatorial Assistant in Bryology, prepared the herbarium specimens, typed the manuscript, and spent many hours both at work and at home on the leaf and capsule outlines and cellular drawings. Anne Hanes did the habit sketches which immensely enhance the utility and value of the book. Gilda Bellolio-Trucco prepared the plates for publication, often making additional drawings, illustrated the glossary and introductory material, and offered technical advice on the preparation of the book. Howard A. Crum, University of Michigan, permitted me to copy from his Glossary, identified problematic specimens, read the manuscript and offered his expertise on various aspects of the work.

The following curators loaned specimens or assisted with my visit to their institution: C.E. Beil, Acadia University; H.A. Crum, University of Michigan; N.G. Miller, Harvard University; H. Robinson, Smithsonian Institution; G. Sayre, Harvard University; W.B. Schofield, University of British Columbia; G.L. Smith, W.C. Steere, New York Botanical Garden; A. Wilson, Nova Scotia Museum.

Finally, I am grateful to Parks Canada for allowing me to collect in the National Parks throughout the Maritimes and to the National Museum of Natural Sciences for supporting this project.

Introduction

This book is intended for those persons who would like to identify and learn the mosses of the Maritime Provinces of Canada, which include the three eastern provinces New Brunswick, Nova Scotia and Prince Edward Island (Plate 1). Although an introductory moss flora exists for one province, namely Nova Scotia (Erskine, 1968), this is the first manual that covers the flora of all three provinces.

The three Maritime provinces are primarily in the vegetation region known as the Acadian Forest Region. A small northern section of New Brunswick, adjacent to the lower part of the Gaspé Peninsula, Québec, contains portions of the Great Lakes–St. Lawrence Forest Region and Boreal Forest Region. A brief account of the vascular plants of these natural-vegetation regions is given by Scoggan (1978). Loucks (1962) describes the Ecoregions of the Maritimes in even greater detail, also discussing the physical features and climate of the area. Roland and Smith (1969) provide a thorough account of all the flowering plants of Nova Scotia and their keys can be used quite successfully for much of New Brunswick and Prince Edward Island.

The moss flora treated here is comprised of 381 species, 19 varieties and one form in 135 genera and 43 families. Only those taxa that have actually been seen and studied are included in the keys and descriptions. Taxa that have been reported in the literature but have not been confirmed from herbarium specimens have been placed in Excluded Taxa. Future studies will undoubtedly confirm the presence in the Maritimes of some on that list, as well as others not reported in this manual.

The distribution patterns of the Maritime mosses, like the mosses throughout North America, are nearly similar to those of the flowering plants. However, the small size of mosses allows them to survive in small niches and their distribution is often related to the microenvironment. For this reason the mosses can persist in regions where a suitable microenvironment exists years after the general climate has changed and organisms influenced primarily by the macroclimate have disappeared. Therefore, bryophytes are often better indicators of an ancient climate than flowering plants.

There are no endemic species of mosses in the Maritimes. Most of the mosses in the Maritimes are common to both the Acadian Forest Region and the Great Lakes–St. Lawrence Forest Region. Some of the floristic elements that are known and some characteristic mosses in each group are as follows:

Arctic–Alpine Element

Occurring primarily in the northern part of New Brunswick and Nova Scotia.

Catoscopium nigritum
Cyrtomnium hymenophylloides
Isopterygium pulchellum
Kiaeria blyttii
Kiaeria starkei
Myurella julacea
Paludella squarrosa
Pogonatum alpinum

Boreal Element

Found throughout most of the Maritime region and one of the commonest components of the flora.

Andreaea rupestris
Calliergon stramineum
Cratoneuron filicinum
Dicranum polysetum
Distichium capillaceum
Ditrichum flexicaule
Grimmia affinis
Helodium blandowii
Herzogiella striatella
Hylocomium splendens
Leskeella nervosa
Mnium spinulosum
Mnium stellare
Plagiothecium laetum
Pleurozium schreberi
Polytrichum strictum
Ptilium crista-castrensis
Rhytidium rugosum
Rhytidiadelphus triquetrus
Scorpidium scorpioides
Sphagnum fuscum
Sphagnum nemoreum
Sphagnum squarrosum
Sphagnum wulfianum
Splachnum luteum
Tetraplodon angustatum
Thuidium abietinum
Tomenthypnum nitens

Temperate Element

Occurring throughout the Maritimes and the second most common element next to the Boreal Element.

Anomodon attenuatus
Anomodon rostratus
Atrichum altecristatum
Atrichum oerstedianum
Barbula unguiculata
Brachythecium acuminatum
Dicranum flagellare
Homomallium adnatum
Hypnum curvifolium
Hypnum imponens
Myurella sibirica
Neckera pennata
Orthotrichum ohioense
Orthotrichum stellatum
Philonotis marchica
Plagiomnium ciliare
Plagiomnium cuspidatum
Taxiphyllum deplanatum
Thuidium delicatulum
Weissia controversa

Coastal Plain Element

Common farther south on the coastal plain of the United States but extending northward to Nova Scotia.

Fontinalis sullivantii
Isopterygium tenerum
Sphagnum macrophyllum
Sphagnum torreyanum

Oceanic Element

Occurring beside or within the region influenced by the ocean.

Dicranum majus
Grimmia maritima (only in spray zone)
Rhytidiadelphus loreus
Sphagnum flavicomans
Sphagnum tenellum
Tetraphis geniculata
Ulota phyllantha (only in spray zone)
Zygodon conoideus

West Coast–Great Lakes Disjunct Element

Common on the West Coast of North America and and occurring as disjunct populations in the Lake Superior region and on the East Coast.

Grimmia hartmanii var. *anomala*
Trichodon cylindricus

Cosmopolitan Element

Common and occurring in most disturbed habitats throughout the world.

Bryum argenteum
Ceratodon purpureus
Funaria hygrometrica
Leptobryum pyriforme

Five mosses in the Maritimes are known to reach their northernmost limit in eastern North America. *Aulacomnium heterostichum, Ditrichum rhynchostegium, Fontinalis sullivantii, Isopterygium tenerum* and *Thelia hirtella* all are more common farther south and are not known north of the Maritimes. Conversely, four mosses in the Maritimes that are more common farther north are known to reach their southernmost extent in eastern North America, namely *Campylium halleri, Catoscopium nigritum, Hypnum recurvatum* and *Timmia austriaca.*

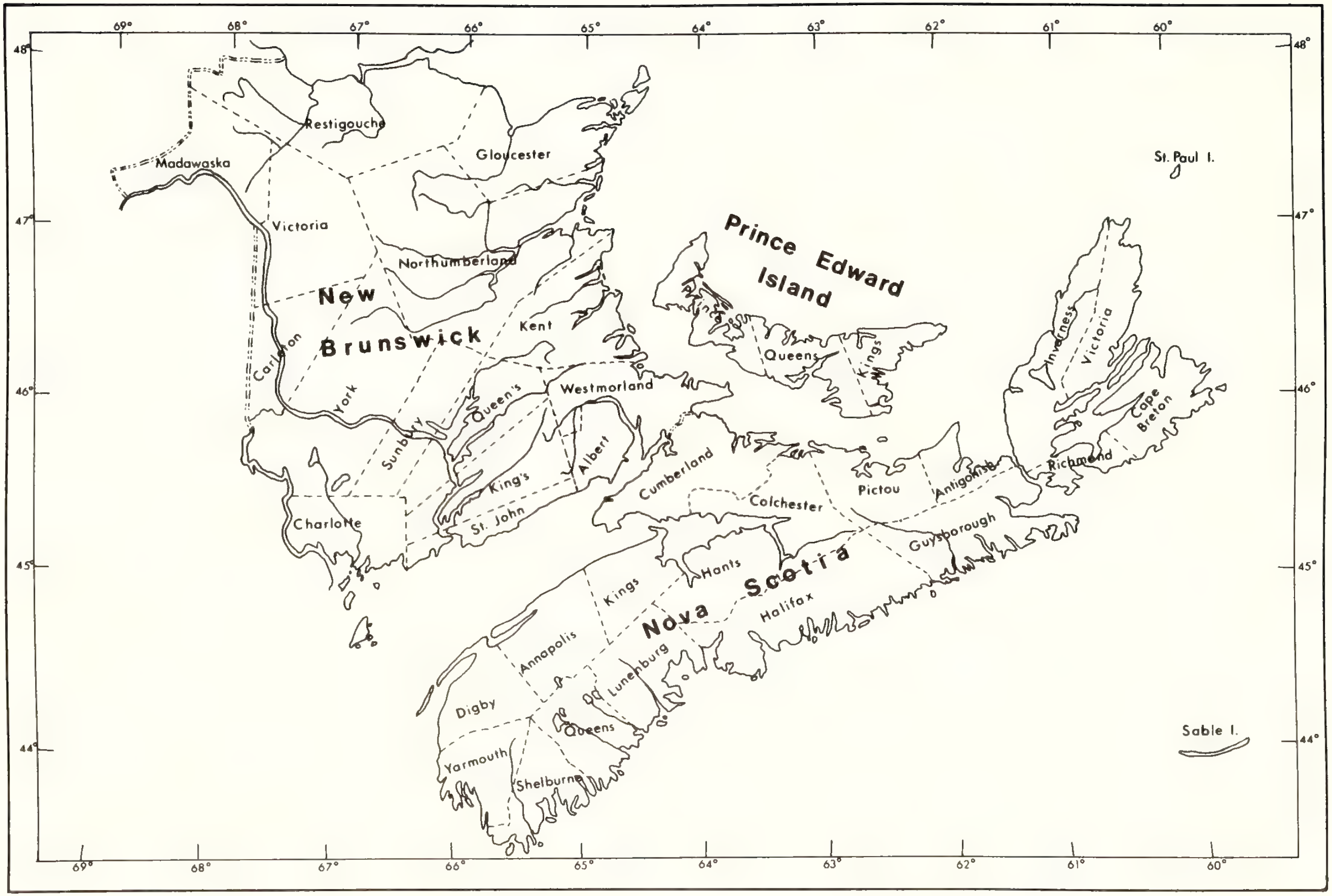

Madawaska
Restigouche
Gloucester
Victoria
Northumberland
New Brunswick
Kent
Carleton
York
Sunbury
Queen's
Westmorland
Albert
King's
St. John
Charlotte
Prince Edward Island
Prince
Queens
Kings
Inverness
Victoria
Cape Breton
Richmond
St. Paul I.
Cumberland
Colchester
Pictou
Antigonish
Guysborough
Hants
Kings
Halifax
Nova Scotia
Annapolis
Lunenburg
Digby
Queens
Yarmouth
Shelburne
Sable I.
69°
68°
67°
66°
65°
64°
63°
62°
61°
60°
48°
47°
46°
45°
44°

Plate 1. Map of the Canadian Maritime Provinces, New Brunswick, Nova Scotia and Prince Edward Island, showing the counties.

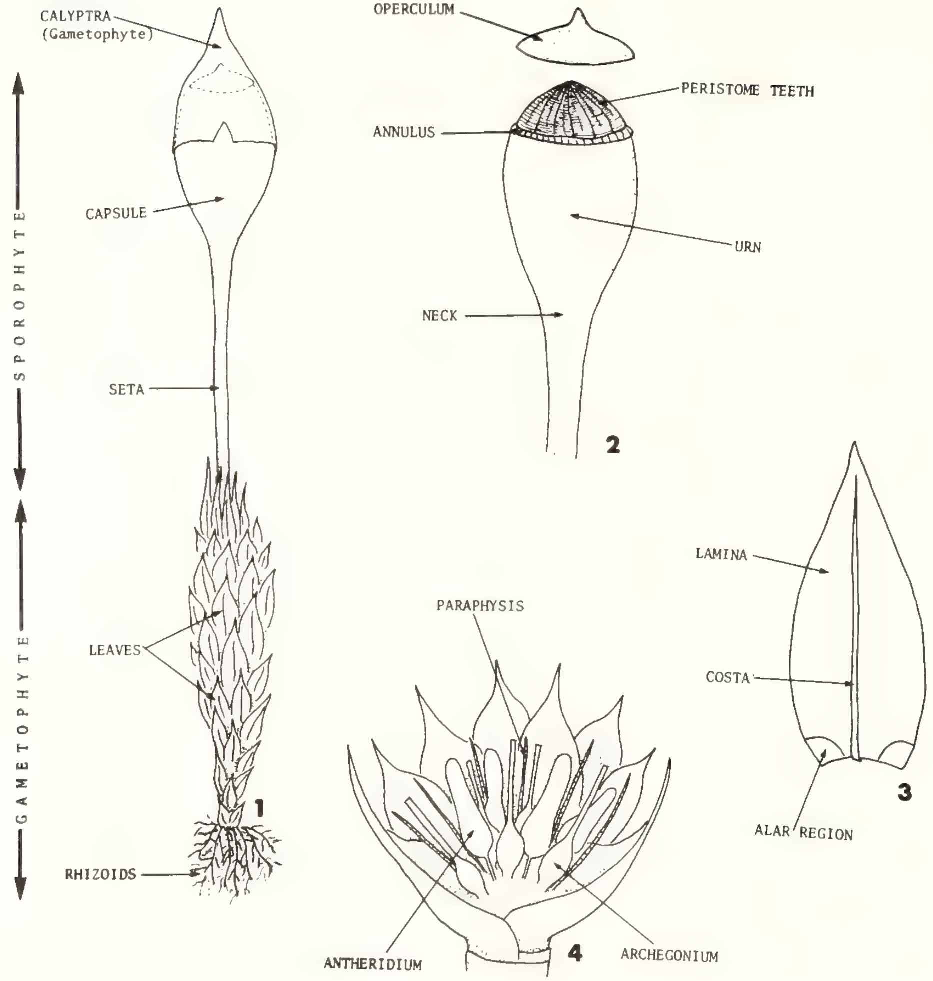

CALYPTRA
(Gametophyte)
SPOROPHYTE
CAPSULE
SETA
GAMETOPHYTE
LEAVES
RHIZOIDS
1
OPERCULUM
PERISTOME TEETH
ANNULUS
URN
NECK
2
LAMINA
COSTA
ALAR REGION
3
PARAPHYSIS
ANTHERIDIUM
ARCHEGONIUM
4

Plate 2. Structure of a moss. 1. Moss plant showing gametophyte and sporophyte. 2. Enlargement of capsule. 3. Leaf. 4. Inflorescence.

Structure of a Moss

The plant body of a typical moss consists of a *gametophyte* and *sporophyte* (Plate 2).

Gametophyte

The gametophyte, which is the conspicuous portion of most mosses, is usually green and leafy. It is anchored to the substrate by *rhizoids* which are mostly brown or reddish structures consisting of branched, filamentous rows of cells with predominantly oblique cross-walls. The *leaves* are in three to five ranks and usually possess a single or double *costa* (or *midrib*), often composed of elongated cells which extend varying distances up the leaf. The leaves are generally unistratose except in the costa region where many layers of cells may occur. Sometimes the leaves are covered with rows of cells or *lamellae* (see glossary). The *stem* is a cylindrical, multicellular, simple or branched structure bearing the rhizoids, leaves, sex organs and sometimes accessory structures (e.g., *paraphyllia* and *pseudoparaphyllia*). The stems of many mosses often have a central strand of small, thin-walled cells, which presumably facilitate water conduction.

The sex organs are in groups enclosed by clusters of often modified leaves and the entire structure, which looks like a small bud, is termed an *inflorescence*. The inflorescences are borne on the stems either apically or laterally (occasionally on short lateral branches). The male organ or *antheridium* is cucumber-shaped and contains numerous, small *sperm* cells, each with two flagella. The female organ or *archegonium* is flask-shaped and contains a single, large egg cell. The antheridia and often the archegonia are intermingled with many, multicellular filaments called *paraphyses*. The antheridia and archegonia, along with the accompanying paraphyses, may be present in one inflorescence (*synoicous*) or in separate inflorescences (*autoicous*) on the same plant, termed *monoicous plants*, or the *antheridia* may be on one plant and the *archegonia* on another plant, termed *dioicous plants*. The sperm cells are released from the antheridia at maturity and must have water in order to swim to the female organ to fertilize the egg. After fertilization a distinctive structure, the sporophyte is formed.

Sporophyte

Often the sporophyte, which is attached to the gametophyte by the *foot*, is gradually raised above the surface of the gametophyte as growth proceeds within the archegonium. Food and water are obtained through this connection with the gametophyte. In most mosses the sporophyte consists of an elongated stalk or *seta* with a *capsule*, differentiated at its distal end into an *urn* and a *neck*. Over the mouth of the capsule is a *calyptra* which is the remnant of the ruptured archegonium and is therefore gametophytic tissue. Under the calyptra is a lid or *operculum* which covers the mouth of the capsule. A ring of hygroscopic cells beneath the operculum, the *annulus*, aids in releasing the operculum from the capsule. The mouth of the capsule is ringed usually by one or two rows of teeth, the *peristome*. The number of teeth may be 4, 8, 16, 32 or 64. *Spores* are produced inside the capsule and the peristome teeth, which are hygroscopic, aid in spore dispersal. Capsules of some mosses lack peristome teeth and some even lack an operculum and an annulus.

Life Cycle of a Moss

The life cycle of a typical moss is depicted in Plate 3. The plant may be annual or perennial depending upon the species.

The illustrations demonstrate how a moss is produced through the normal method of *sexual reproduction*. However, mosses employ another common method of propagation called *asexual* or *vegetative reproduction*. A specialized branch, a part of a leaf, or almost any young cell of most mosses is capable of producing a new gametophyte. Quite often, special reproductive bodies called *gemmae* are produced in large numbers on the leaves, stems or rhizoids of the gametophyte. Each gemma, after becoming detached from the parent plant and landing in a favorable environment, will form a gametophyte and in some instances a sporophyte through a series of stages similar to that of the sexually produced spore. Some mosses never produce sex organs nor sporophytes and thus rely upon vegetative methods of reproduction.

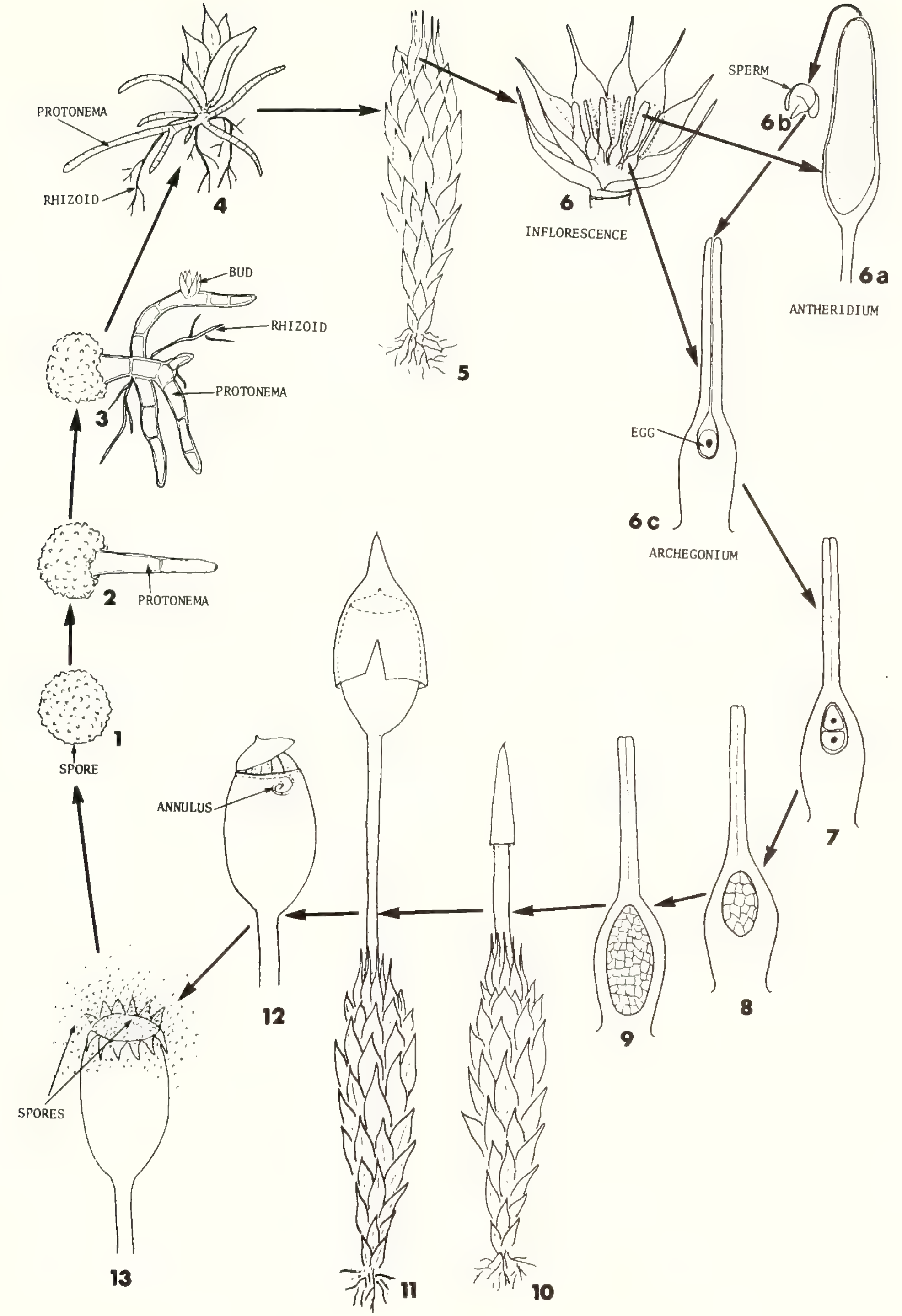

PROTONEMA
RHIZOID
4
SPERM
6b
6
INFLORESCENCE
6a
ANTHERIDIUM
BUD
RHIZOID
PROTONEMA
3
5
EGG
6c
ARCHEGONIUM
2
PROTONEMA
1
SPORE
ANNULUS
7
12
8
9
SPORES
13
11
10

Plate 3. Life cycle of a moss. 1. Spore. 2. Germinating spore with developing protonema. 3–4. Development of gametophyte. 5. Mature gametophyte bearing sex organs. 6. Inflorescence with antheridia and archegonia. 6a. Antheridium. 6b. Sperm. 6c. Archegonium and fertilization. 7–9. Development of sporophyte. 10. Gametophyte bearing immature sporophyte. 11. Gametophyte bearing mature sporophyte. 12. Detail of mature capsule before spore release. 13. Detail of capsule showing spore release.

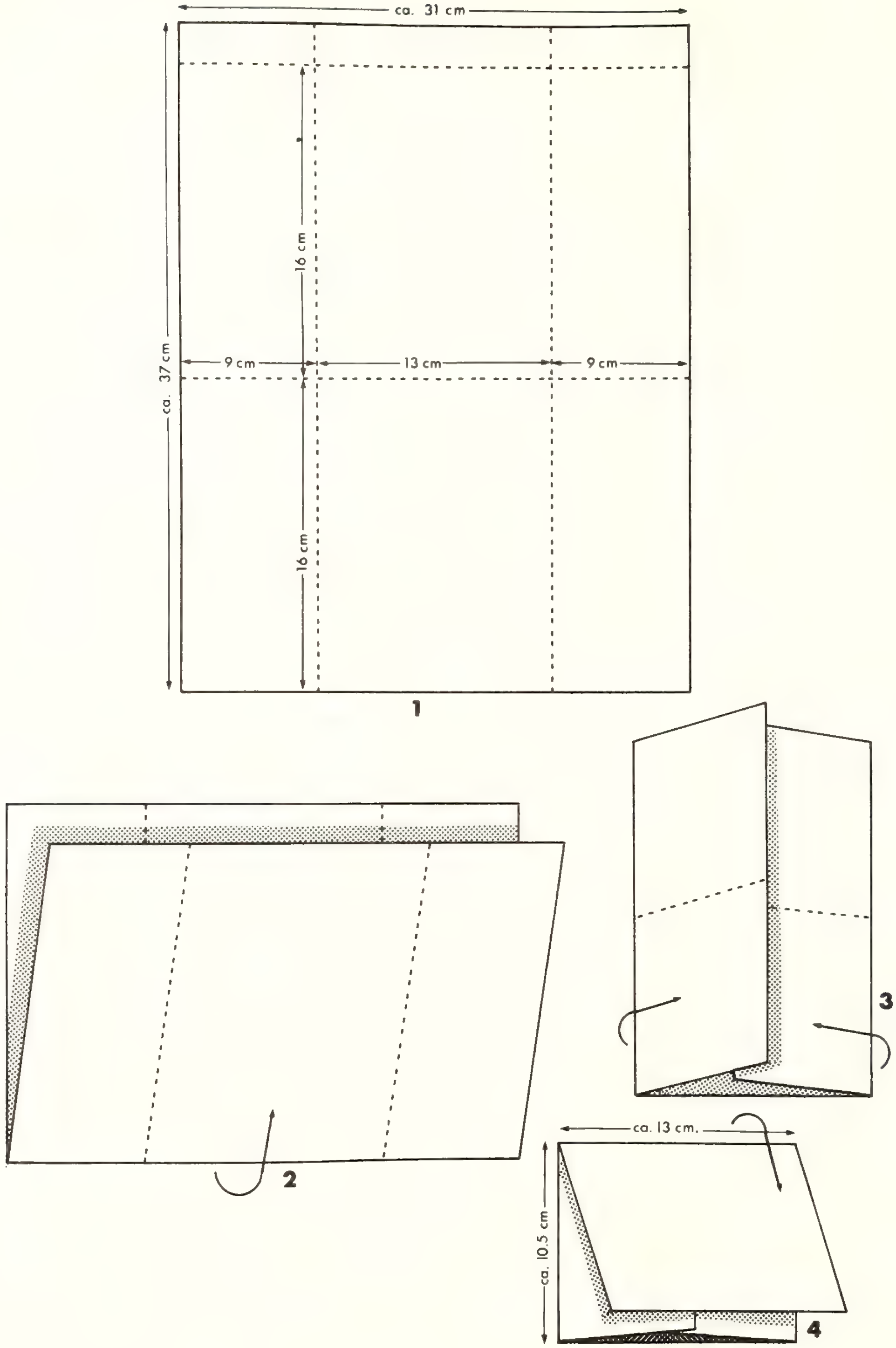

ca. 31 cm
ca. 37 cm
16 cm
9 cm
13 cm
9 cm
16 cm
1
2
3
ca. 13 cm.
ca. 10.5 cm
4

Plate 4. Newspaper packet for field collections.

Collecting and Herbarium Techniques

Mosses are abundant in the Maritime Provinces so that finding them usually presents no problem. They occur on a variety of substrates, such as soil, rock, wood, humus, animal remains, etc., but because they are poorly equipped to store water and require water for reproduction, they are usually restricted to moist, shady environments. It is for this reason that they are commonly seen carpeting forest floors, covering stones in streams and brooks, clinging to cliff walls of waterfalls, or growing in dense masses in swamps, fens and bogs. They generally avoid arid habitats but there are some species that prefer drier conditions. Marine environments are also avoided except in the case of two Maritime species (*Grimmia maritima* and *Ulota phyllantha*) that occur only in the spray zone on the seashore.

A 10X to 14X hand-lens is extremely helpful for field work in order to see the minute structure of the mosses. Several plants of each species should be removed from the substrate with the fingers or a knife. If the plants are removed from water or are growing in wet environments, such as a bog, the surplus water should be wrung out. Mosses in tufts should be divided into small groups in order to dry. Plants bearing sporophytes should be sought whenever possible. In the case of dioicous mosses, both male and female plants should be included in the collection. Each moss collection is put into a prefolded newspaper packet (Plate 4), approximately 10.5 x 13 cm, and the substrate recorded on the outside of the packet with a felt tip marking pen or some other permanent type of marker that will not blur when wet. The locality is also recorded on each packet, usually with a code number. The locality information, including the province, county, distance to nearest town, longitude and latitude, the date and any ecological information, such as exposure, moisture, surrounding vegetation (e.g., spruce-fir forest), should be recorded in a field book. All collections from one locality are kept together in a collecting bag (cloth or plastic). Small paper sacks (2 lb.) may be substituted for the newspaper packets if no time is available to fold the packets but they are not as good for the drying of the mosses since the paper sack retains the moisture longer than newspaper.

Upon returning to field camp the mosses should be prepared for rapid drying to prevent molding and to preserve the colour. The newspaper absorbs much of the moisture and any packets that are thoroughly wet or torn should be replaced. Approximately 30–100 packets are then placed in a specially made fish-net bag (cotton decorative netting is the best and least expensive) and hung up to dry (Plate 5). The packets in the bag should be tumbled every few hours to facilitate drying. If a dry, indoor room is available it is not necessary to put the packets in a fish-net bag because the packets can simply be spread out and unfolded to expose the plants to the air.

At home or in the laboratory the specimens are prepared for an herbarium or permanent reference collection. Packets are folded (Plate 6) from sheets of paper (21.5 x 28 cm) of good quality (50–100% rag content with 20–24 lb. weight) resulting in a standard size of about 10 x 14.5 cm. The mosses should be further cleaned and trimmed to fit into the packet. A smaller packet may be folded for small plants or loose parts and placed inside the standard packet. Each collection is given a separate number. The name of the moss and the collecting data are put on the packet's flap or a separate label slightly smaller than the flap to be pasted on it (Plate 7). The label should bear the following information: name(s) of moss with author(s), country (optional), province or state, county, locality (including kilometers to nearest town, longitude and latitude), habitat (including substrate), date collected, collector, collection number, person who identified specimen if different from collector, and year identified. The specimens may then be conveniently stored in shoe boxes for future reference.

Plate 5. Moss collections hanging to dry.

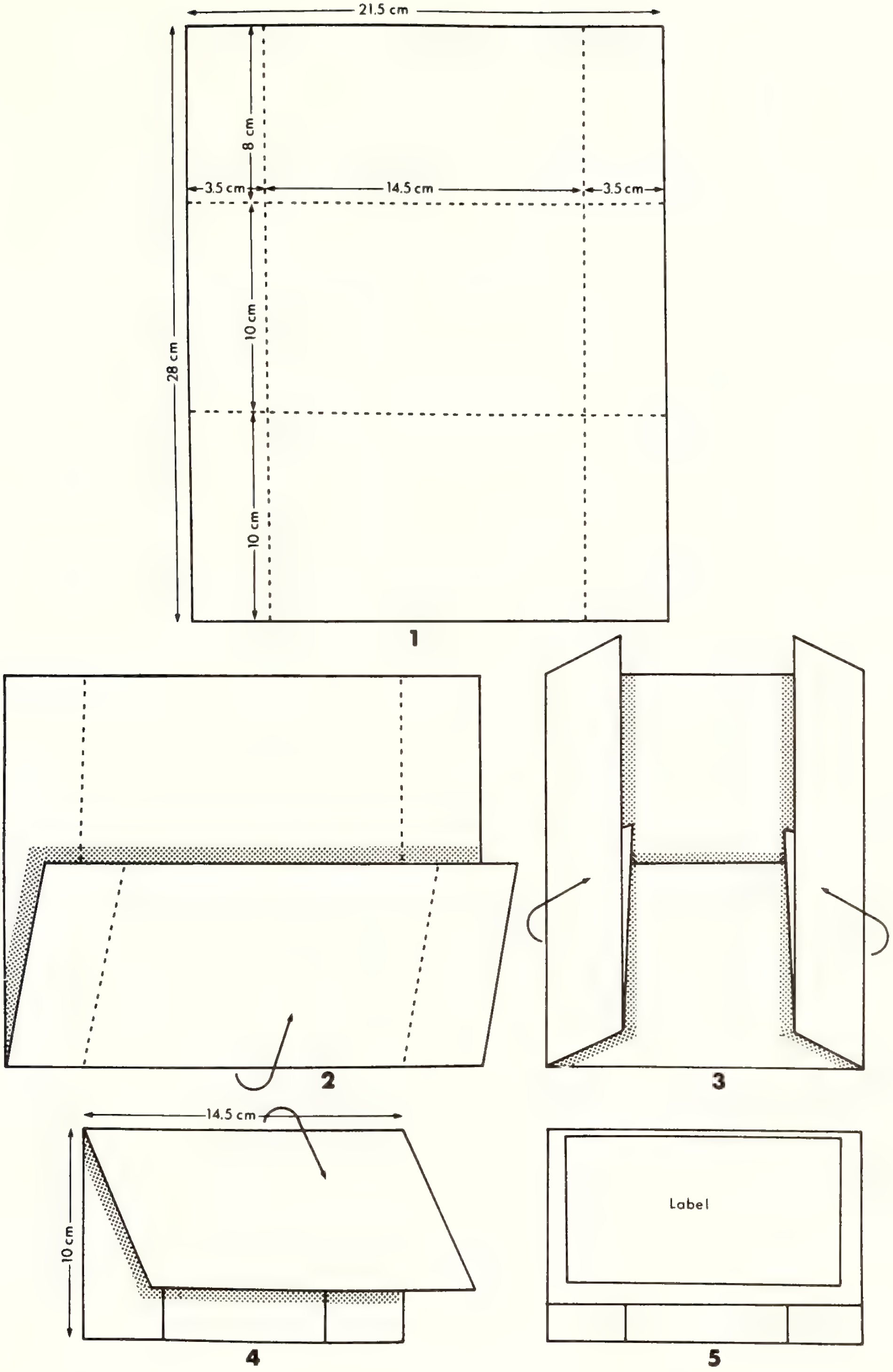
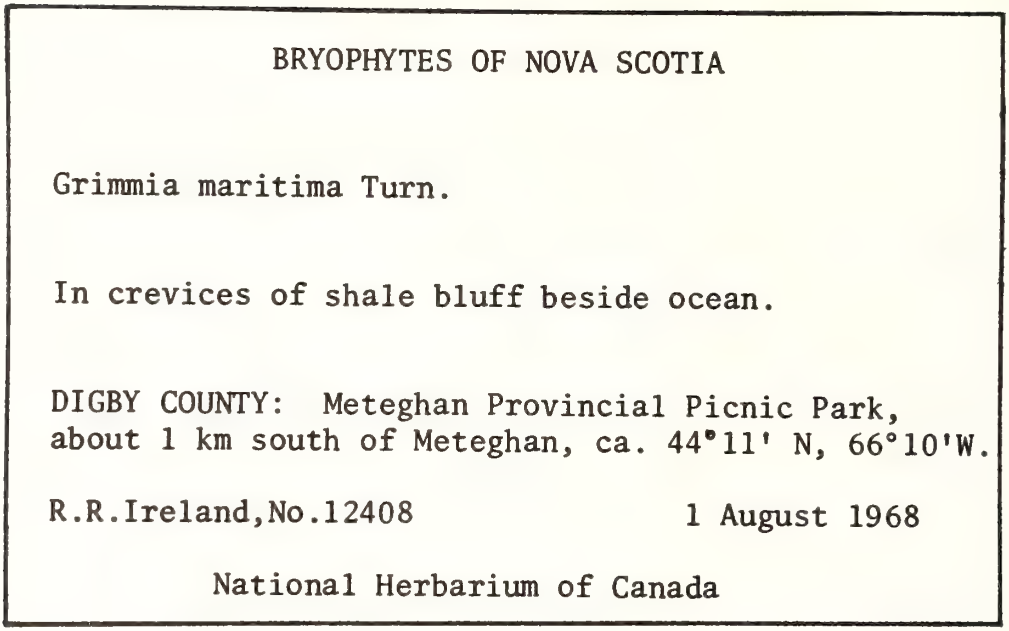

21.5 cm
8 cm
3.5 cm
14.5 cm
3.5 cm
28 cm
10 cm
10 cm
1
2
3
14.5 cm
10 cm
Label
4
5

Plate 6. Specimen packet for herbarium.



BRYOPHYTES OF NOVA SCOTIA

Grimmia maritima Turn.

In crevices of shale bluff beside ocean.

DIGBY COUNTY: Meteghan Provincial Picnic Park, about 1 km south of Meteghan, ca. 44°11' N, 66°10'W.

R.R.Ireland,No.12408 1 August 1968

National Herbarium of Canada

Plate 7. Label for herbarium specimen.

Collectors of Maritime Mosses

A number of persons have made significant contributions to our knowledge of the moss flora of the Maritime Provinces through their collections. All collections cited in the text are in CANM unless stated otherwise. The following list gives the collector, the province(s) where they collected (NB — New Brunswick; NS — Nova Scotia; PEI — Prince Edward Is.) and the year(s) of their collections:

Bailey, H.B. NS: 1901.
Bartram, E.B. NS: 1921.
Beatty, L.D. NB: 1952.
Beil, C.E. NS: 1970.
Bentley, P.A. NS; 1954–55.
Beschel, R.E. NB: 1956.
Bird, C.D. NS: 1966.
Bowers, T. NS: 1973, 1975.
Brittain, J. NB: 1888.
Brown, C.P. NS: 1931.
Brown, L.S. NB: 1911; NS: 1927, 1934.
Brown, M.S. NS: 1917, 1920–1941, 1945–48, 1950, 1963.
Browne, A.F. PEI: 1904.
Cain, R.F. NB, NS: 1963.
Cameron, E. NS: 1947.
Chalmers, R. NB: 1875–77, 1882.
Clayton, L. NS: 1934.
Collins, J.F. NB: 1902; NS: 1903.
Comeau, P.L. NB: 1975; NS: 1970, 1972, 1974–75.
Cook, F.S. NS: 1977.
Cunningham, G.C. NB, NS: 1958.
Davidson, D.W. NB: 1944.
Dho, A. NB: 1975.
Donly, J.F. NS: 1956.
Dore, W.G. NB: 1945.
Dugal, A. NS: 1976.
Duman, M. NS: 1939.
Dunham, E.M. NB: 1910, 1914.
Ella, M. NS: 1979.
Erskine, D.S. PEI: 1953.
Erskine, J.S. NB: 1954; NS: 1921, 1938, 1945–56, 1964–65, 1967–70.
Farlow, W.G. NB: 1898, 1902.
Fassett, N.C. NS: 1921.
Fernald, M.L. NB: 1902; NS: 1921.
Fisher, E.G. NB: 1963.
Fowler, J. NB: 1866–80, 1888, 1890, 1892, 1904; NS: 1868, 1873, 1901.
Gillett, J.M. NS: 1972.
Gleason, H.A., Jr. NB: 1936.
Gorham, E. NS: 1946.
Gorham, R.P. NB: 1945.
Grandtner, M.M. PEI: 1970.
Güssow, H.T. NS: 1911.
Habeeb, H. NB: 1942–46, 1948–49, 1951; NS: 1942.
Hand, C.H. NB: 1955, 1963; NS: 1963.
Hay, G.U. NB: 1878, 1882–84.
Howe, C.D. NS: 1901.
Illman, W.I. NB: 1955.
Ingalls, R.A. NB: 1945.
Ireland, R.R. NB: 1967–68, 1970, 1974; NS: 1967-68, 1974; PEI: 1967, 1970.
James, T.P. NB: 1870, 1872; NS: 1872, 1873; PEI: 1873.
Kirkpatrick, R. NB: 1948.
Lamb, I.M. NS: 1952.
Lang, W.F. NS: 1901.
Long, B. NS: 1921.
Longley, A.E. NS: 1919.
Loucks, O.L. NB: 1955, 1958.
Maass, W.S.G. NB: 1961; NS: 1961, 1966; PEI: 1961.
*Macoun, J. NB: 1881–84, 1888–89, 1891–94, 1898–99; NS: 1882–84, 1887, 1898–99, 1910; PEI: 1888.
Martin, J.L. NS: 1953.
McKay, A.H. NB: 1883–84; NS: 1874, 1876, 1879–80, 1883.
Melançon, M. NB, NS: 1978.
Melbourne, C. NS: 1932.
Moser, J. NB: 1874, 1878, 1885–94, 1897–99; NS: 1894.
Muma, W. NB: 1977.
Nichols, G.E. NS: 1909, 1914–16.
O'Neill, H. NS: 1939.
Peterson, P. NS: 1964.
Porsild, A.E. NS: 1966.
Prince, A.R. NS: 1921, 1928.
Roberts, P.R. NB: 1961.
Robinson, C.B. NS: 1903, 1911.
Roland, A.E. NS: 1979.
Ross, K. NS: 1946.
Salter, V. NS: 1946.
Schofield, M.B. NS: 1956-57.

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*Note — Some of the collecting dates on the labels of John Macoun's collections may be inaccurate since other people sent collections to Macoun and he or someone else may have been careless when labelling the collections.

Schofield, W.B. NS: 1949, 1951–57, 1959, 1965–66.
Scotter, G.W. NS: 1970.
Shchepanek, M.J. NS: 1976.
Smith, E.C. NS: 1944, 1949, 1954–55.
Smith, M.W. NB: 1954.
Smith, R.T. NS: 1970.
Soper, J.H. NS: 1972.
Spence, E.J. NB: 1877.
Squires, W.A. NB: 1950.
Stanley, J.M. NS: 1972.
Sylvester, J. NB: 1974.
Taylor, W.R. NB: 1922.
Vreeland, F.K. NS: 1905.
Wallace, E.C. NS: 1973.
Warren, G.C. NS: 1941–42, 1945–46.
Weatherby, C.A. NB: 1926.
Webster, D.H. NS: 1954–55.
Wetmore, J.E. NB: 1884–85.
Wiley, F.A. NB: 1939.
Williams, E.F. NB: 1902.
Wilson, A. NS: 1976.

Identification and Methods of Study

Both a compound (magnification up to ca. 400X) and dissecting microscope (magnification up to 50X), the latter preferably with a transmitted light base, are necessary to identify most mosses. A dried moss is first removed from its packet and revived to its original appearance by soaking it in a small dish of water for a short time. This enables the leaves to be detached easily from the stem. The leaves from the middle third of the stem should be removed for study since they are fully developed and are the ones used in this book for the illustrations and descriptions. Leaves of large mosses may be removed with forceps by pulling downward and away from the stem apex in order to preserve as much of the decurrent leaf base as possible. The leaves of small mosses are removed in a drop of water under the dissecting microscope with two dissecting needles. One needle is used to hold the plant down while the other is used to scrap off the leaves, remembering to scrape from the step apex toward the base. The leaves and a portion of the defoliated stem are then placed under separate cover slips on the same microscope slide for observation.

Cross-sections of stems and leaves are cut freehand using a razor blade while observing the procedure under the dissecting scope. Stems are sectioned after first removing the leaves from a portion of a wet plant. The defoliated stem is placed on a microscope slide with a small drop of water about 1 cm away. The index finger of one hand holds the stem down while the razor blade is held in the other. The razor blade is held vertically at right angles to the stem so that it rests on top of the stem and against the finger nail. Thin sections are cut against the slide using a short chopping motion. By keeping the index finger in the same place on the stem and by bending the finger, the position of the nail may be changed so that several sections may be cut. The sections usually remain on the blade until touched to the drop of water which permits them to float free. Leaves may be cut in a similar way except for small leaves and *Sphagnum* branch leaves it is better to leave them attached to the axis and start cutting the sections from the apex downwards. The freehand sectioning method may require some practice and experimentation before success is achieved.

Study of the peristome, exothecial cells and stomata requires that a wet capsule containing few spores, so as not to interfere with viewing, be sectioned lengthwise. One half of the capsule is mounted with outer surface up and the other with inner surface upward.

Microscopic features of *Sphagnum*, especially pores, are usually best observed after staining. A saturated solution of gentian violet or crystal violet in distilled water makes a good stain. The stems, branches or leaves are first soaked in water and then placed in the stain for a few seconds. The stained plant tissues may then be mounted on a slide in the usual manner to be observed under the microscope.

Hoyer's solution is recommended as a permanent mounting medium for any slides that are desired for future reference (Anderson, 1954). The formula for the solution, which should be mixed at room temperature in the order listed, is as follows:

Distilled water	50 cc
Gum arabic (U.S.P. Flake)	30 grams
Chloral hydrate	200 grams
Glycerin	20 cc

Dried plants should be thoroughly soaked in water before being transferred to Hoyer's solution. The solution is an effective clearing agent and it allows dense plant parts, such as densely papillose cells and peristome teeth, to be more easily viewed.

Reference Books

The following books may be useful for learning more about the mosses and the taxonomy of the taxa that occur in the Maritimes:

General

Parihar, N.S. 1972. An introduction to Embryophyta. Volume I. Bryophyta. 377 pp. Central Book Depot, Allahabad.

Schofield, W.B. 1965. Division Bryophyta. pp. 302–351. In R.F. Scagel, G.E. Rouse, J.R. Stein, R.J. Bandoni, W.B. Schofield and T.M.C. Taylor, An Evolutionary Survey of the Plant Kingdom. Wadsworth Publishing Company, Belmont.

Watson, E.V. 1971. The structure and life of bryophytes. 3rd Ed. 211 pp. Hutchinson University Library, London.

Taxonomy

Breen, R.S. 1963. Mosses of Florida, 273 pp. University of Florida Press, Gainesville.

Conard, H.S. 1979. How to know the mosses and liverworts, 302 pp. Revised Ed., P.L. Redfearn, William C. Brown Company, Dubuque.

Crum, H.A. 1976. Mosses of the Great Lakes Forest. Revised Ed. 404 pp. University of Michigan, Ann Arbor.

Crum, H.A. and L.E. Anderson. 1981. Mosses of eastern North America. 2 Vols., 1328 pp. Columbia University Press, New York.

Darlington, H.T. 1964. The mosses of Michigan. 212 pp. Cranbrook Institute of Science, Bloomfield Hills.

Flowers, S. 1973. Mosses: Utah and the West. 567 pp. Brigham Young University Press, Provo.

Grout, A.J. 1928–34. Moss flora of North America, north of Mexico. Vol. 3, 268 pp. Published by the author, New York and Newfane.

Grout, A.J. 1933–40. Moss flora of North America, north of Mexico. Vol. 2, 273 pp. Published by the author, Newfane.

Grout, A.J. 1936–39. Moss flora of North America, north of Mexico. Vol. 1, 253 pp. Published by the author, Newfane.

Jennings, O.E. 1951. A manual of the mosses of western Pennsylvania and adjacent regions. 396 pp. University of Notre Dame Press, Notre Dame.

Lawton, E. 1971. Moss flora of the Pacific Northwest. 362 pp., 195 plates. The Hattori Botanical Laboratory, Nichinan.

Schofield, W.B. 1969. Some common mosses of British Columbia. 262 pp. British Columbia Provincial Museum, Handbook 28, Victoria.

Smith, A.J.E. 1978. The moss flora of Britain and Ireland. 706 pp. Cambridge University Press, Cambridge.

Watson, E.V. 1955. British mosses and liverworts. 419 pp. Cambridge University Press, Cambridge.

Welch, W.H. 1957. Mosses of Indiana. 478 pp. The Bookwalter Company, Indianapolis.

Nomenclature and Classification

The nomenclature in this book primarily follows the Checklist of the Mosses of Canada (Ireland *et al.* 1980). Few mosses have a common name but each one has a scientific name usually consisting of two Latin or Latinized Greek words. The first word is capitalized and is the name of the genus. The second word is the species and this is followed by the name of the person(s), often abbreviated, who first described the moss. An example is *Fissidens adiantoides* Hedw., the Hedw. being an abbreviation for Johannes Hedwig. Sometimes a second person(s) transfers the moss from one genus to another or from one taxonomic category to another, such as from a variety to a species. The person(s) making the transfer then has their name(s) placed after the describer's name, with the describer's name placed in parentheses. An example is *Ditrichum lineare* (Sw.) Lindb., the Sw. standing for Olof Swartz, who described the moss as *Didymodon linearis*, and the Lindb. standing for Sextus Otto Lindberg, who transferred the species from *Didymodon* to *Ditrichum*. The scientific name of a moss is not complete unless it includes the genus, species and the name of the person(s) responsible for the name in accordance with the rules of the International Code of Botanical Nomenclature. The naming of mosses, like other plants, is quite complicated and one should consult the most recent edition of the International Code of Botanical Nomenclature for further details.

Included in this book, following the person(s) responsible for the scientific name, is the literature citation, usually abbreviated, stating where the moss was described and where any transfer was made. Synonyms (i.e., mosses that are considered the same as the accepted name) are included under each species. Species are subdivided further into varieties and forms while genera are grouped into families and higher taxonomic categories.

The mosses in this book are arranged in a systematic order that is nearly similar to the one used in Crum and Anderson (1981) which is basically that of Brotherus (1924–25) and probably the one most commonly used today.

SYNOPSIS OF CLASSIFICATION

Division Bryophyta

Subdivision Musci

- Class SPHAGNOPSIDA
  - Order SPHAGNALES
    - Family **Sphagnaceae**
      - *Sphagnum*
- Class ANDREAEOPSIDA
  - Order ANDREAEALES
    - Family **Andreaeaceae**
      - *Andreaea*
- Class BRYOPSIDA
  - Subclass BRYIDAE
    - Order FISSIDENTALES
      - Family **Fissidentaceae**
        - *Fissidens*
    - Order SCHISTOSTEGALES
      - Family **Schistostegaceae**
        - *Schistostega*
    - Order DICRANALES
      - Family **Ditrichaceae**
        - *Pleuridium*
        - *Ditrichum*
        - *Trichodon*
        - *Saelania*
        - *Ceratodon*
        - *Distichium*
      - Family **Seligeriaceae**
        - *Seligeria*
        - *Blindia*
      - Family **Dicranaceae**
        - *Trematodon*
        - *Dicranella*
        - *Rhabdoweisia*
        - *Cynodontium*
        - *Dichodontium*
        - *Dicranoweisia*
        - *Oncophorus*
        - *Kiaeria*
        - *Dicranum*
        - *Paraleucobryum*
      - Family **Leucobryaceae**
        - *Leucobryum*
    - Order POTTIALES
      - Family **Encalyptaceae**
        - *Encalypta*
      - Family **Pottiaceae**
        - Subfamily Trichostomoideae
          - *Gymnostomum*
          - *Astomum*
          - *Weissia*
          - *Oxystegus*
          - *Tortella*
          - *Bryoerythrophyllum*
          - *Didymodon*
          - *Barbula*
        - Subfamily Pottioideae
          - *Phascum*
          - *Aloina*
          - *Pottia*
          - *Desmatodon*
          - *Tortula*
    - Order GRIMMIALES
      - Family **Grimmiaceae**
        - *Grimmia*
        - *Rhacomitrium*
    - Order FUNARIALES
      - Family **Funariaceae**
        - *Physcomitrium*
        - *Funaria*
      - Family **Ephemeraceae**
        - *Ephemerum*
      - Family **Splachnaceae**
        - *Tayloria*
        - *Tetraplodon*
        - *Splachnum*
    - Order BRYALES
      - Family **Bryaceae**
        - *Pohlia*
        - *Plagiobryum*
        - *Leptobryum*
        - *Bryum*
        - *Rhodobryum*
      - Family **Mniaceae**
        - *Mnium*
        - *Plagiomnium*
        - *Pseudobryum*
        - *Cyrtomnium*
        - *Rhizomnium*
      - Family **Aulacomniaceae**
        - *Aulacomnium*
      - Family **Meesiaceae**
        - *Paludella*
        - *Meesia*
      - Family **Catoscopiaceae**
        - *Catoscopium*
      - Family **Bartramiaceae**
        - *Plagiopus*
        - *Bartramia*
        - *Philonotis*
      - Family **Timmiaceae**
        - *Timmia*

- Order ISOBRYALES
  - Family **Ptychomitriaceae**
    - *Campylostelium*
  - Family **Orthotrichaceae**
    - *Zygodon*
    - *Amphidium*
    - *Orthotrichum*
    - *Ulota*
    - *Drummondia*
  - Family **Hedwigiaceae**
    - *Hedwigia*
  - Family **Leucodontaceae**
    - *Leucodon*
  - Family **Fontinalaceae**
    - *Fontinalis*
    - *Dichelyma*
  - Family **Neckeraceae**
    - *Neckera*
    - *Homalia*
    - *Thamnobryum*
- Order HYPNOBRYALES
  - Family **Fabroniaceae**
    - *Anacamptodon*
  - Family **Leskeaceae**
    - *Leskea*
    - *Leskeella*
    - *Lescuraea*
    - *Pterigynandrum*
    - *Thelia*
    - *Haplohymenium*
    - *Anomodon*
  - Family **Thuidiaceae**
    - *Myurella*
    - *Heterocladium*
    - *Haplocladium*
    - *Thuidium*
    - *Helodium*
  - Family **Amblystegiaceae**
    - *Sciaromium*
    - *Hygroamblystegium*
    - *Amblystegium*
    - *Leptodictyum*
    - *Platydictya*
    - *Campylium*
    - *Cratoneuron*
    - *Drepanocladus*
    - *Hygrohypnum*
    - *Scorpidium*
    - *Calliergon*
    - *Calliergonella*
  - Family **Brachytheciaceae**
    - *Tomenthypnum*
    - *Isothecium*
    - *Brachythecium*
    - *Bryhnia*
    - *Cirriphyllum*
    - *Conardia*
    - *Eurhynchium*
    - *Stokesiella*
  - Family **Entodontaceae**
    - *Entodon*
    - *Pleurozium*
  - Family **Plagiotheciaceae**
    - *Plagiothecium*
  - Family **Sematophyllaceae**
    - *Brotherella*
    - *Sematophyllum*
  - Family **Hypnaceae**
    - *Platygyrium*
    - *Pylaisiella*
    - *Homomallium*
    - *Callicladium*
    - *Hypnum*
    - *Isopterygium*
    - *Taxiphyllum*
    - *Herzogiella*
    - *Ctenidium*
    - *Ptilium*
  - Family **Rhytidiaceae**
    - *Rhytidium*
    - *Rhytidiadelphus*
  - Family **Hylocomiaceae**
    - *Hylocomium*
  - Family **Climaciaceae**
    - *Climacium*
- Subclass BUXBAUMIIDAE
  - Order BUXBAUMIALES
    - Family **Buxbaumiaceae**
      - *Buxbaumia*
    - Family **Diphysciaceae**
      - *Diphyscium*
- Subclass TETRAPHIDIDAE
  - Order TETRAPHIDALES
    - Family **Tetraphidaceae**
      - *Tetraphis*
      - *Tetradontium*
- Subclass POLYTRICHIDAE
  - Order POLYTRICHALES
    - Family **Polytrichaceae**
      - *Atrichum*
      - *Pogonatum*
      - *Polytrichum*

Use of Keys

The keys in this book present two identically numbered statements. The statement that most accurately fits the moss being identified should always be selected. The leaders to the right of each statement indicate either a name, which is that of the moss, or another number. If it is a number, proceed to that number and again make a choice, always selecting the statement that better describes the specimen being identified. When a name is reached, indicating the identity of the moss, the illustrations, description, and other information regarding that particular moss should be carefully checked to make certain everything matches the specimen. If the identification seems incorrect, return to the point in the key where the name occurs in order to find the error. By proceeding in the key or retracing each step backward the correct name of the moss should be found. When there is indecision as to which statement best fits the specimen, both leads probably should be followed in order to find the one that provides the correct name of the moss. When it is not clearly understood what is meant by a statement in the key, time may be saved by simply finding an illustration showing the character in the glossary or by comparing the unknown moss with the species illustrations in question. For example, after reading the first pair of statements in the Key to Genera, it may save time to turn to the illustrations of *Sphagnum* to get a quick idea of the general appearance of members of that genus.

Since it is easy for the beginner to confuse the Hepaticae (commonly called liverworts) with their close allies, the mosses, the major differences follow:

Subdivision Hepaticae (Liverworts)
[Not Treated Here]

Plant thalloid or leafy, with 2–3 ranks of leaves (one row on each side of the stem and the third, if present, on the underside of the stem, midway between the lateral leaves); leaves usually round, lobed or deeply incised; costa lacking.

Subdivision Musci (Mosses)

Plant leafy (leaves not evident in *Buxbaumia*) but leaves usually in more than 2 ranks (two-ranked in *Fissidens, Distichium*, and pinnate plants of *Schistostega*); leaves rarely round, or, if so, never lobed or dissected; costa often present, single or double.

Key to Genera

1. Plants usually with 2 to several branches in fascicles, branches crowded at the stem apex forming a head-like tuft, sometimes tinged with brilliant reddish pigments; leaf cells a network of chlorophyllose cells and large hyaline cells with microscopic pores and spiral bands; plants in bogs, fens, swamps, wet depressions in woods, at pond and lake margins, or other hydric habitats . . . . *Sphagnum* (p. 41)

1. Plants without branches in fascicles and leaf cells not a network of chlorophyllose and hyaline cells 2

    2. Leaves distichous, appearing to be inserted edgewise giving the plants a flattened appearance, split in the lower half with the two halves clasping the stem . *Fissidens* (p. 100)

    2. Leaves not distichous or if so, not split in the lower half 3

3. Plants apparently lacking leaves, consisting mostly of a large, conspicuous capsule, 5–7 mm long, elevated on a long, warty seta . . . . *Buxbaumia* (p. 655)

3. Plants usually with conspicuous leaves 4

    4. Plants with a large, ovoid capsule and lacking a seta; capsule surrounded by bristle-tipped leaves . . . . *Diphyscium* (p. 657)

    4. Plants usually with a small capsule and with a conspicuous seta or if lacking seta, capsule not ovoid nor surrounded by bristle-tipped leaves 5

5. Plants erect, small, stems less than 2 cm high, brown, reddish brown to black, rupestral; capsule eperistomate, opening most of its length by 4 longitudinal slits .... *Andreaea* (p. 96)
5. Plants otherwise; capsule peristomate or eperistomate, usually opening at the tip by an operculum, rarely by rupture of capsule wall 6
   6. Plants whitish green, usually 3–6 cm high, in large, rounded cushions on the ground; leaves dense, imbricate, mostly tubulose, multistratose, many cells, especially near apex, with a large central pore (seen in cross-section) .... *Leucobryum* (p. 196)
   6. Plants otherwise; leaf cells always lacking central pore 7
7. Plants with sterile, frondiform shoots, the leaves distichous, with confluent leaf bases, ecostate .... *Schistostega* (p. 112)
7. Plants lacking sterile, frondiform shoots with confluent leaf bases 8
   8. Main stem of plant erect or nearly so, simple or with only a few branches; costa usually prominent, single; sporophyte arising from stem apex or a branch below 9
   8. Main stem prostrate, sometimes with erect tips, usually much branched, often pinnate, rarely simple or if so, the stems long and intertwined; costa often indistinct, single, double, or frequently lacking; sporophyte arising from main stem somewhere below tip 109

ACROCARPOUS MOSSES

9. Gemmae cups (formed by apical leaves) present at tips of sterile shoots; peristome teeth 4; plants mainly on rotten wood; common .... *Tetraphis* (p. 659)
9. Gemmae cups lacking; peristome teeth 4, or multiples of 4, sometimes lacking; plants on various substrates 10
   10. Peristome teeth 4; clusters of ecostate, linear-clavate vegetative leaves arising around fertile plants; plants on rock; rare .... *Tetradontium* (p. 663)
   10. Peristome teeth 8 or more, sometimes lacking; plants on various substrates 11
11. Leaves with lamellae or branched filaments on upper surface 12
11. Leaves lacking lamellae or branched filaments 15

Leaves with Lamellae or Filaments on Upper Surface

   12. Leaves entire at apex, upper surface with branched filaments .... *Aloina* (p. 229)
   12. Leaves toothed at apex, upper surface with lamellae 13
13. Lamellae few, less than 10; leaves undulate, crisped or contorted when dry, costa narrow; calyptrae hispid at the apex .... *Atrichum* (p. 665)
13. Lamellae numerous, more than 10; leaves rigid, not undulate, scarcely contorted when dry, costa broad; calyptrae densely hairy 14
   14. Lamellae with marginal cells smooth or minutely papillose (best seen in cross-section); capsules angled .... *Polytrichum* (p. 682)
   14. Lamellae with marginal cells papillose; capsules terete .... *Pogonatum* (p. 675)

Leaves Lacking Lamellae and Filaments on Upper Surface

15. Leaves narrow, often subulate, 15–30 or more times as long as leaf width near middle; costa covering most of leaf near middle 16
15. Leaves broad, lanceolate, ovate, obovate or oblong, mostly less than 15 times as long as broad; costa covering only a small portion of leaf near middle 35

Leaves Narrow (More than 15:1)

16. Leaves distichous, thereby giving gametophyte a noticebly flattened appearance . . . . *Distichium* (p. 131)

16. Leaves in more than 2 rows, gametophyte not noticeably flattened 17

17. Capsules immersed, leaves extending far above its mouth . . . . *Pleuridium* (p. 114)

17. Capsules exserted, extending above the leaves 18

18. Plants very small, gametophyte seldom reaching 4 mm high 19

18. Plants larger, gametophyte mostly 4 mm high or more 21

19. Leaves squarrose from an enlarged base; plants on soil . . . . *Trichodon* (p. 125)

19. Leaves not squarrose, without enlarged base; plants on sandstone or limestone 20

20. Leaves strongly curled when dry, margins often bistratose above leaf middle; peristome teeth bifid, papillose . . . . *Campylostelium* (p. 383)

20. Leaves straight or nearly so, margins unistratose; peristome teeth entire, smooth . . . . *Seligeria* (p. 135)

21. Leaf cells papillose 22

21. Leaf cells smooth 27

22. Leaf cells with several papillae per cell 23

22. Leaf cells with 1 papilla per cell, sometimes present at the end of the cell 24

23. Leaves with plane, entire margins and a V-shaped region of hyaline, elongate, mostly smooth cells at base; leaf cells with nearly round, irregularly arranged papillae . . . . *Tortella* (p. 213)

23. Leaves with recurved, serrate margins and lacking V-shaped region of differentiated basal cells; leaf cells with elongate papillae in rows often appearing as striations . . . *Plagiopus* (p. 370)

24. Alar cells noticeably differentiated, often inflated and coloured . . . . *Dicranum* (p. 171)

24. Alar cells not noticeably differentiated 25

25. Leaf margin plane . . . . *Kiaeria* (p. 167)

25. Leaf margins recurved 26

26. Leaves long, often 4–5 mm, strongly serrate, often doubly serrate on margins; capsules globose when wet . . . . *Bartramia* (p. 372)

26. Leaves short, seldom reaching 4 mm, weakly serrate to serrulate with single teeth; capsules cylindric when wet . . . . *Cynodontium* (p. 158)

27. Alar cells noticeably differentiated, often inflated and coloured 28

27. Alar cells not noticeably differentiated 30

28. Leaves entire to minutely denticulate; capsules short, nearly as broad as long . . . . *Blindia* (p. 139)

28. Leaves serrate to serrulate; capsules long, much longer than broad 29

29. Costae broad, occupying about $^{2}/_{3}$ of leaf at the base and nearly all of the leaf near the middle, striate on dorsal surface . . . . *Paraleucobryum* (p. 194)

29. Costae narrow, occupying about $^{1}/_{3}$ of leaf at the base and usually less above, smooth or with 2–4 ridges on dorsal surface . . . . *Dicranum* (p. 171)

30. Capsules distinctly narrowed at the neck, the neck nearly as long as the remainder of the urn (especially noticeable when dry) 31

30. Capsules not narrowed at neck 32

31. Capsules cylindric, erect to somewhat inclined . . . . *Trematodon* (p. 142)

31. Capsules pyriform, horizontal to pendulous . . . . *Leptobryum* (p. 306)

32. Leaves squarrose, with an enlarged base clasping the stem; capsules strumose; plants usually on wood . . . . *Oncophorus* (p. 165)

32. Leaves not squarrose or if squarrose, without enlarged clasping base; capsules with or without struma; plants usually on soil or rock 33

33. Leaf margins strongly and broadly recurved, bistratose; apical leaf cells as long or nearly as long as broad; capsules erect, deeply furrowed when dry .... *Cynodontium* (p. 158)
33. Leaf margins plane, incurved, sometimes narrowly and indistinctly recurved, unistratose or bistratose; apical leaf cells longer than broad; capsules erect to inclined, smooth or with shallow furrows 34
34. Peristome teeth filiform, the teeth divided to the base and about the same size throughout, papillose .... *Ditrichum* (p. 117)
34. Peristome teeth lanceolate, the teeth divided only halfway to base which is broader, vertically pitted-striolate below .... *Dicranella* (p. 144)

Leaves Broad (Less than 15:1)

35. Leaf cells papillose, mammillose or with cuticular ridges 36
35. Leaf cells smooth 66

Leaf Cells Papillose, Mammillose or with Cuticular Ridges

36. Leaf cells with cuticular ridges or 1 papilla or mammilla per cell 37
36. Leaf cells with several papillae per cell 47
37. Alar cells strongly differentiated, inflated and often coloured 38
37. Alar cells not noticeably differentiated 39
38. Leaf cells papillose or mammillose; plants dioicous .... *Dicranum* (p. 171)
38. Leaf cells with cuticular ridges; plants autoicous .... *Dicranoweisia* (p. 163)
39. Leaf margins entire 40
39. Leaf margins serrate 43
40. Leaves with plane margins, apex broad and obtuse ... *Orthotrichum obtusifolium* (p. 392)
40. Leaves with recurved margins, apex narrow and acute 41
41. Basal leaf cells thick-walled, strongly pitted; leaf margins unistratose; gemmae, when present, cylindric, in conspicuous rounded masses at leaf tips .... *Ulota* (p. 401)
41. Basal leaf cells thin-walled, lacking pits or pits indistinct; leaf margins sometimes bistratose; gemmae, when present, globose, often concealed on stems and leaves 42
42. Costae covered by short cells on upper surface; axillary gemmae often present, globose, multicellular bodies .... *Didymodon* (p. 220)
42. Costae covered by elongate cells on upper surface; gemmae lacking .... *Barbula fallax* (p. 223)
43. Apical leaf cells elongate, papillae small and near the end of the cells; capsules nearly as broad as long, narrowed at mouth .... *Philonotis* (p. 374)
43. Apical leaf cells short, about as broad as long, papillae large and approximately in the center of the cells; capsules longer than broad, scarcely, if at all, narrowed at mouth 44
44. Leaf margins bistratose 45
44. Leaf margins unistratose 46
45. Leaves often hyaline-tipped near stem and branch apices; gemmae rarely present in globose clusters at tips of deformed leaves; capsules immersed .... *Grimmia* (p. 244)
45. Leaves lacking hyaline tips; gemmae lacking; capsules exserted .... *Cynodontium* (p. 158)
46. Sterile stems often present bearing clusters of gemmae or brood bodies at the tip of a naked or nearly naked pseudopodium; capsules ribbed when dry; peristome double .... *Aulacomnium* (p. 358)
46. Sterile stems without pseudopodia bearing gemmae; capsules smooth when dry; peristome single .... *Dichodontium* (p. 161)
47. Leaf margins involute almost to apex 48
47. Leaf margins plane or recurved 50

48. Leaves ending in a long, hyaline hair-point; globose gemmae on the upper leaf surface; lacking sporophytes; plants on tree trunks .... *Tortula* (p. 239)

48. Leaves lacking long hair-point and gemmae; sporophytes often present; plants on soil or soil over rock 49

49. Capsules immersed .... *Astomum* (p. 206)

49. Capsules exserted on a long seta .... *Weissia* (p. 208)

50. Leaf cells with thick, strongly sinuose walls .... *Rhacomitrium* (p. 257)

50. Leaf cells sometimes thick-walled but the walls not sinuose 51

51. Apical leaf cells elongate; capsules nearly as broad as long .... *Philonotis* (p. 374)

51. Apical leaf cells short, about as broad as long; capsules longer than broad 52

52. Plants on trees, often several feet above ground, sometimes on rock, but not on soil; plants in small cushions or tufts, often rounded in outline 53

52. Plants on soil or rock, sometimes in rock crevices, occasionally on bases of trees; plants often in extensive tufts 55

53. Leaves with plane margins, basal cells nearly as long as broad; 3–7 celled clavate gemmae common in leaf axils; sporophytes rarely produced and neither sex organs nor sporophytes known from the Maritimes; plants on trees .... *Zygodon* (p. 385)

53. Leaves with recurved margins, basal cells much longer than broad; gemmae usually lacking; sporophytes frequently produced; plants on trees or rocks 54

54. Leaves with two types of cells at base, thick-walled, linear cells near costa and short cells with thick cross-walls along the margins; capsules with superficial stomata .... *Ulota* (p. 401)

54. Leaves with only one type of cell at base and lacking differentiated cells along margins; capsules with superficial or immersed stomata .... *Orthotrichum* (p. 392)

55. Leaves with a V-shaped region of hyaline, elongate, mostly smooth cells at base .... *Tortella* (p. 213)

55. Leaves lacking V-shaped region of differentiated cells 56

56. Stems frequently with 1–several long branches; plants often in tight, compact tufts 57

56. Stems simple or sometimes with 1, rarely 2, short or long branches; plants scattered or in loose tufts 59

57. Leaves with a few distinct teeth near apex, margins strongly recurved; plants noticeably reddish below; peristome present, teeth very short .... *Bryoerythrophyllum* (p. 218)

57. Leaves entire or minutely serrulate at apex, margins plane or weakly recurved; plants not reddish below; peristome lacking 58

58. Papillae elliptic or oval on basal leaf cells, numerous, usually 4–8 per cell; capsules immersed to somewhat exserted .... *Amphidium* (p. 389)

58. Papillae round on basal leaf cells, few, 2–4 per cell, sometimes lacking; capsules exserted on a long seta .... *Gymnostomum* (p. 202)

59. Plants with filiform gemmae on stems .... *Encalypta procera* (p. 199)

59. Plants lacking gemmae 60

60. Plants small, stems 2–4 mm high; capsules immersed .... *Phascum* (p. 227)

60. Plants with stems usually larger than 4 mm; capsules exserted 61

61. Leaves narrow, often over 5 times as long as wide, gradually narrowed to an acute apex, margins plane; plants not known to produce sporophytes in the Maritimes ... *Oxystegus* (p. 211)

61. Leaves broad, seldom 5 times as long as wide, often abruptly narrowed to a mucro or hair-point, margins recurved; sporophytes frequently present 62

62. Leaves with a toothed hair-point or a very long mucro; peristome teeth long and twisted .... *Tortula* (p. 239)

62. Leaves with a short mucro or a blunt apex; peristome lacking or present, teeth short or long and twisted 63

63. Capsules lacking peristome .... *Pottia* (p. 231)

63. Capsules with peristome 64

64. Calyptrae mitrate, covering all or most of capsule, fringed at base; capsules erect, up to 3 mm long .... *Encalypta* (p. 198)

64. Calyptrae cucullate, covering only a portion of capsule, without fringed base; capsules erect to inclined, up to 2 mm long 65

65. Leaves with recurved margins nearly to apex, sometimes margins bordered with elongate, thick-walled cells, basal cells elongate and thin-walled; capsules erect or inclined, with short peristome teeth, rarely lacking teeth .... *Desmatodon* (p. 233)

65. Leaves with plane margins in upper half, margins not bordered, basal cells short and thick-walled; capsules erect, with long, twisted teeth .... *Barbula* (p. 222)

Leaf Cells Smooth

66. Leaves strongly squarrose-recurved, nearly as broad as long .... *Paludella* (p. 363)

66. Leaves not squarrose-recurved or, if so, much longer than broad 67

67. Plants minute, scarcely reaching 2 mm high; capsules immersed; plants on bare soil .... *Ephemerum* (p. 276)

67. Plants larger, usually over 2 mm high; capsules exserted or sometimes immersed; plants on various substrates 68

68. Leaf cells thick-walled and strongly sinuose-nodulose .... *Rhacomitrium* (p. 257)

68. Leaf cells thin-walled or sometimes thick-walled but not sinuose 69

69. Leaves entire to minutely denticulate 70

69. Leaves serrulate to strongly toothed 84

Leaves Entire To Minutely Denticulate

70. Alar cells differentiated, often inflated and coloured .... *Blindia* (p. 139)

70. Alar cells not differentiated 71

71. Leaves with a distinct border of linear cells, often in several rows and layers, the walls usually thicker than the inner cells 72

71. Leaves not bordered or border indistinct 75

72. Leaves ovate, oblong, lingulate or spatulate, narrow, mostly less than 1 mm wide 73

72. Leaves obovate to rounded-ovate, broad, usually more than 1 mm wide 74

73. Leaves ovate to oblong-ovate or lanceolate, costa often long-excurrent; peristome double .... *Bryum* (p. 308)

73. Leaves oblong to lingulate or spatulate, costa subpercurrent to short-excurrent; peristome single or lacking .... *Desmatodon* (p. 233)

74. Leaves rounded or ending in a short, blunt mucro .... *Rhizomnium* (p. 353)

74. Leaves acute, with a short mucro or apiculus .... *Cyrtomnium* (p. 351)

75. Plants julaceous, leaves shiny, concave, nearly as broad as long 76

75. Plants not julaceous and leaves not shiny or, if so, leaves longer than broad 77

76. Plants yellowish green, leaves obtuse to broadly acute, apex plane, costa ending below apex to percurrent .... *Pohlia filiformis* (p. 288)

76. Plants whitish green above, pink or red below, leaves acuminate, apex reflexed, costa excurrent .... *Plagiobryum* (p. 304)

77. Leaves with apical cells about as broad as long, thick-walled 78

77. Leaves with apical cells mostly longer than broad, thin-walled or rarely thick-walled 80

78. Main stem prostrate, with numerous erect branches; plants on tree trunks .... *Drummondia* (p. 407)

78. Main stem erect, branches few and also erect; plants on soil or rock 79

79. Capsules exserted on a long, straight seta; gemmae often present, globose, multicellular .... *Didymodon* (p. 220)

79. Capsules immersed or exserted on a short, curved seta; gemmae lacking .... *Grimmia* (p. 244)

80. Leaf apices obtuse, sometimes a few somewhat acute 81

80. Leaf apices acute 82

81. Leaves linear-lanceolate, narrowed at apex, costa percurrent to excurrent; capsules erect, without a distinct neck ... *Ditrichum lineare* (p. 118)
81. Leaves lingulate, scarcely narrowed at apex, costa ending below apex; capsules inclined above an erect neck ... *Meesia uliginosa* (p. 365)
82. Plants bulbiform; capsules on a flexuose seta, urn sulcate when dry ... *Funaria* (p. 274)
82. Plants not bulbiform; capsules on a straight seta, urn smooth when dry ... 83
83. Leaves concave, with a long, flexuose point; capsules cylindric, erect ... *Tetraplodon mnioides* (p. 280)
83. Leaves keeled, without flexuose point; capsules round to ovoid, pendulous ... *Catoscopium* (p. 368)

Leaves Serrulate To Strongly Toothed

84. Leaves with a border of linear cells whose walls are usually thicker than the inner cells .. 85
84. Leaves lacking border ... 88
85. Leaf margins with teeth in pairs ... *Mnium* (p. 334)
85. Leaf margins with single teeth, or margins serrate to serrulate ... 86
86. Median leaf cells mostly rounded or hexagonal, about as broad as long; leaf margins toothed, the teeth sometimes composed of several cells ... *Plagiomnium* (p. 342)
86. Median leaf cells rhomboidal, much longer than broad; leaf margins serrate to serrulate, sometimes nearly entire, rarely toothed ... 87
87. Plants large, leaves arranged in a terminal rosette, leaves up to 1 cm long; 1–5 sporophytes per plant ... *Rhodobryum* (p. 332)
87. Plants comparatively small, leaves seldom arranged in a terminal rosette, leaves up to 5 mm long; sporophytes solitary ... *Bryum* (p. 308)
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88. Apical leaf cells elongate ... 101

Apical Leaf Cells Isodiametric

89. Alar cells strongly differentiated, inflated and often coloured ... *Dicranum* (p. 171)
89. Alar cells not noticeably differentiated ... 90
90. Leaves with an enlarged, sometimes orange, sheath that clasps stem, margins strongly incurved when dry; calyptrae attached to seta just below capsule ... *Timmia* (p. 380)
90. Leaves lacking sheath, margins not incurved; calyptrae not attached to seta ... 91
91. Plants bluish green and glaucous due to a whitish granular or cottony substance on the leaves and stems ... *Saelania* (p. 127)
91. Plants not glaucous ... 92
92. Leaves with large marginal teeth sometimes composed of several cells, most cells with a single, large indistinct papilla in the centre ... *Aulacomnium heterostichum* (p. 358)
92. Leaves with small marginal teeth composed of a single cell ... 93
93. Leaves, especially the upper, with long, hyaline tips ... *Grimmia* (p. 244)
93. Leaves lacking hyaline tips ... 94
94. Leaves in three distinct ranks, widely spreading to squarrose; setae long, often over 7 cm ... *Meesia triquetra* (p. 365)
94. Leaves not three-ranked or squarrose; setae short, seldom up to 3 cm ... 95
95. Leaf margins plane ... 96
95. Leaf margins recurved ... 99
96. Leaves narrow, about 0.5 mm wide ... 97
96. Leaves broad, mostly 1 mm wide ... 98
97. Leaves with a distinct region of hyaline cells at base that are much broader and longer than the cells above ... *Rhabdoweisia* (p. 156)
97. Leaves lacking region of hyaline cells at base ... *Kiaeria* (p. 167)

    98. Costae red, leaves long-decurrent .... *Mnium stellare* (p. 335)
    98. Costae green or yellow, leaves short-decurrent or nondecurrent .... *Tayloria* (p. 278)
99. Costae percurrent to excurrent, often reddish, especially near the stem; leaf margins unistratose; setae purplish to red .... *Ceratodon* (p. 129)
99. Costae ending below apex and lacking reddish colour; leaf margins bistratose or unistratose; setae yellow to brown 100
    100. Leaf margins unistratose .... *Rhabdoweisia* (p. 156)
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105. Leaves narrowed to a long, flexuose point, the margins with teeth sometimes composed of 2 cells; setae short, the leaves extending above the mouth of the capsule .... *Tetraplodon angustatus* (p. 280)
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PLEUROCARPOUS MOSSES

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123. Plants small, stems seldom reaching 5 cm in length .... *Haplocladium* (p. 463)
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126. Leaves with a border of 3–5 rows of linear cells in 1–2 layers; plants on rocks in streams .... *Sciaromium* (p. 476)
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128. Plants complanate, leaves oblong-lingulate with a broadly rounded to abruptly acute apex .... *Homalia* (p. 432)
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130. Stems bearing axillary clusters of brood branchlets at or near the apices; leaves smooth, costa excurrent as a slender acumen .... *Leskeella* (p. 441)
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131. Alar cells abruptly inflated or enlarged 132
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132. Leaf apices broadly obtuse, nearly as broad as leaf near middle; plants in bogs, fens, swamps, wet depressions in woods and other wet habitats .... *Calliergon* (p. 528)

132. Leaf apices acute or narrowly obtuse; plants of wet or dry habitats 133

133. Stems with foliose paraphyllia, sometimes few and difficult to see; median leaf cells short, seldom up to 6 times as long as broad .... *Cratoneuron* (p. 504)

133. Stems lacking paraphyllia; median leaf cells long, often over 6 times as long as broad .... *Drepanocladus* (p. 508)

134. Leaf margins serrulate to serrate from apex to middle or sometimes to base 135

134. Leaf margins entire to serrulate near apex, entire below 136

135. Leaves small, mostly 1 mm or less long; small, foliose to filamentous pseudoparaphyllia present; gemmae borne on leaves, filamentous .... *Conardia* (p. 568)

135. Leaves large, usually 1 mm or more long; pseudoparaphyllia lacking or large and foliose; gemmae lacking .... *Brachythecium* (p. 540)

136. Leaves in 3 rows, narrow, often subulate, 6 or more times as long as broad; capsules immersed .... *Dichelyma* (p. 425)

136. Leaves in more than 3 rows, broad, less than 6 times as long as broad; capsules exserted 137

137. Leaves entire, apical cells thick-walled and isodiametric; plants on tree trunks .... *Drummondia* (p. 407)

137. Leaves serrulate or sometimes entire, apical cells thin to thick-walled and elongate; plants on soil, rock, wood or bases of trees 138

138. Leaves with costa broad, scarcely narrowed near apex, basal cells mostly rectangular, rarely quadrate; plants usually occurring on rocks in or near water .... *Hygroamblystegium* (p. 479)

138. Leaves with costa narrow, becoming narrower and indistinct near apex, basal cells mainly quadrate or shortly rectangular; plants on soil, wood, bases of trees but usually not on rocks in water .... *Amblystegium varium* (p. 483)

139. Plants very small, leaves seldom reaching 0.5 mm long, costa often short and indistinct; plants on wood .... *Platydictya* (p. 491)

139. Plants small to large, leaves mostly 1 mm or more in length, costa long, often reaching $^{1}/_{2}$ to $^{2}/_{3}$ length of leaf, distinct; plants on various substrates 140

140. Median leaf cells short, mostly less than 6 times as long as wide 141

140. Median leaf cells long, usually 6–15 times as long as wide 145

141. Plants subdendroid to dendroid, leaves with margins coarsely and irregularly serrate, costa often with teeth on dorsal surface .... *Thamnobryum* (p. 434)

141. Plants not dendroid, leaves with margins entire to regularly serrate, costa without teeth on dorsal surface 142

142. Plants usually high up on trees in seepy knotholes or cracks; capsules erect and straight, strongly contracted below mouth when dry, peristome teeth reflexed when dry .... *Anacamptodon* (p. 436)

142. Plants not on trees in seepy knotholes or cracks but sometimes on bases of trees; capsules inclined and arcuate, peristome teeth not reflexed when dry 143

143. Leaves with a somewhat channelled acumination, alar cells often inflated or enlarged, sometimes coloured .... *Campylium* (p. 495)

143. Leaves with a flat apex, alar cells not inflated and seldom enlarged 144

144. Leaves with margins entire to serrate in upper half, rarely serrate to base, alar regions often with quadrate to transversely rectangular cells .... *Amblystegium* (p. 483)

144. Leaves with margins serrulate to serrate nearly to base, alar regions with rectangular or sometimes quadrate cells .... *Leptodictyum trichopodium* (p. 487)

145. Plants somewhat julaceous, with concave leaves abruptly contracted to a long-filiform apex .... *Cirriphyllum* (p. 566)

145. Plants not with concave leaves that are abruptly contracted to a long-filiform apex 146

146. Leaves acute, sometimes nearly obtuse, strongly serrate to serrulate nearly to base, costa often ending in a tooth on the dorsal surface; opercula long-rostrate, arcuate 147
146. Leaves acuminate, rarely nearly acute, entire to serrate, costa usually smooth; opercula conic to short-rostrate, straight 148
147. Stems much branched, nearly pinnate; leaves long-decurrent .... *Stokesiella* (p. 575)
147. Stems with few branches; leaves nondecurrent or short-decurrent .... *Eurhynchium* (p. 570)
148. Plants regularly branched, large, up to 10 cm high, stems densely tomentose with brown rhizoids almost to apex, leaves strongly plicate, nearly straight; plants in bogs or fens .... *Tomenthypnum* (p. 535)
148. Plants mostly irregularly branched, lacking dense tomentum, leaves smooth or plicate, sometimes falcate; plants in various habitats 149
149. Leaves acute to acuminate, falcate-secund, especially near stem and branch tips; alar cells often inflated; plants in extremely wet habitats, mainly bogs, fens, swamps, and lakes .... *Drepanocladus* (p. 508)
149. Leaves acute to narrowly obtuse, straight or sometimes falcate, but not secund; alar cells gradually enlarged, rarely somewhat inflated 150
150. Leaves narrowly obtuse, margins usually with a few serrulations at the apex; plants on rocks in or near streams and creeks .... *Hygrohypnum* (p. 517)
150. Leaves acute, margins entire or serrulate to serrate nearly to base 151
151. Leaves entire 152
151. Leaves serrulate to serrate 153
152. Leaves smooth, margins plane, alar cells elongate; plants in wet habitats .... *Leptodictyum* (p. 487)
152. Leaves plicate, margins often recurved at base, alar cells quadrate; plants in dry habitats .... *Brachythecium albicans* (p. 543)
153. Plants with numerous attenuate branches, leaves smooth, with irregularly serrate margins and numerous round, thick-walled alar cells .... *Isothecium* (p. 538)
153. Plants rarely with attenuate branches, leaves often plicate, with regularly serrate margins and quadrate to rectangular, thin-walled alar cells .... *Brachythecium* (p. 540)

Costae Double or Lacking

154. Stems and branches covered with numerous paraphyllia; plants often bi- or tri-pinnately branched, frequently frondose .... *Hylocomium* (p. 645)
154. Stems and branches lacking paraphyllia but pseudoparaphyllia sometimes present 155
155. Leaf cells papillose 156
155. Leaf cells smooth 162

Leaf Cells Papillose

156. Leaf cells with 1–2 papillae over the lumen 157
156. Leaf cells prorate on dorsal surface 158
157. Leaf cells with 1–2 papillae per cell; plants large, leaves with a hyaline apex, 1–2 mm long, perichaetial leaves ciliate; plants on noncalcareous rock .... *Hedwigia* (p. 409)
157. Leaf cells with 1 papilla per cell; plants small, leaves without a hyaline apex, up to 0.5 mm long, perichaetial leaves lacking cilia; plants on calcareous rock .... *Myurella sibirica* (p. 458)
158. Plants irregularly branched, stems and branches julaceous, slender, seldom up to 0.5 mm wide 159
158. Plants mostly regularly branched, stems not julaceous, branches sometimes julaceous, mostly over 0.5 mm wide 160

159. Leaves loosely imbricate, apices spreading when dry, elliptic to broadly ovate, usually longer than broad, costa distinct, sometimes reaching $^1/_4$ length of leaf; gemmae present, 2–4 celled ovoid or cylindric bodies .... *Pterigynandrum* (p. 445)

159. Leaves tightly imbricate, apices erect when dry, rounded to rounded ovate, often as long as broad, costa faint, seldom reaching but a few cells up leaf; gemmae lacking .... *Myurella julacea* (p. 457)

160. Stem and branch leaves different, stem leaves acuminate, spreading to squarrose, branch leaves acute to rounded, imbricate and julaceous .... *Heterocladium* (p. 461)

160. Stem and branch leaves similar except in size 161

161. Plants large, stems up to 15 cm long, leaves often 5 mm long or longer .... *Rhytidiadelphus triquetrus* (p. 641)

161. Plants small, stems up to 6 cm long, leaves mostly 2 mm long, rarely longer .... *Ctenidium* (p. 634)

Leaf Cells Smooth

162. Plants on rocks submerged in flowing water or on rocks protruding from water or beside water 163

162. Plants not usually aquatic or semi-aquatic, occurring on rock, wood, humus or rarely soil 164

163. Plants small, stems up to 5 cm long, leaves in more than 3 rows, often as wide as long, costa usually distinct .... *Hygrohypnum* (p. 517)

163. Plants large, stems usually more than 5 cm long, sometimes up to 20 cm, leaves in 3 rows, usually longer than wide, costa lacking .... *Fontinalis* (p. 415)

164. Median leaf cells short, mostly less than 6 times as long as wide 165

164. Median leaf cells long, usually 6 or more times as long as wide 169

165. Plants large, leaves usually 1–2 mm long .... *Leucodon* (p. 411)

165. Plants small, leaves usually less than 1 mm long 166

166. Plants julaceous .... *Myurella julacea* (p. 457)

166. Plants not julaceous 167

167. Leaves squarrose .... *Campylium hispidulum* (p. 496)

167. Leaves not squarrose 168

168. Leaves falcate-secund, stems often subpinnately to pinnately branched .. *Hypnum* (p. 605)

168. Leaves straight or somewhat curved but not falcate-secund, stems simple or with a few branches .... *Platydictya* (p. 491)

169. Alar cells enlarged and inflated, often orange 170

169. Alar cells not enlarged or inflated 182

Alar Cells Enlarged and Inflated

170. Leaves serrate to serrulate throughout .... *Herzogiella striatella* (p. 631)

170. Leaves entire or sometimes serrate only at apex 171

171. Plants pinnately to subpinnately branched, leaves close, imbricate, stem leaves apiculate 172

171. Plants irregularly branched, stem leaves not apiculate 173

172. Stems red, epidermal cells small and thick-walled in cross-section; alar cells orange .... *Pleurozium* (p. 579)

172. Stems green to yellowish green, epidermal cells large and thin-walled in cross-section; alar cells hyaline or yellow .... *Calliergonella* (p. 533)

173. Plants large, stems often 10 cm long, leaves strongly concave, falcate, irregularly wrinkled .... *Scorpidium* (p. 526)

173. Plants small, stems seldom up to 8 cm long, leaves flat or slightly concave, straight or falcate, smooth 174

174. Leaves cordate-ovate, spreading to squarrose .... *Campylium stellatum* (p. 496)

174. Leaves not cordate-ovate, usually oblong-ovate or ovate-lanceolate 175

175. Leaves falcate-secund, the tips turned toward the substrate 176

175. Leaves not or rarely falcate-secund (sometimes only at tips of stems and branches) 177

176. Stems with short, filamentous pseudoparaphyllia .... *Brotherella* (p. 588)

176. Stems with foliose pseudoparaphyllia or lacking pseudoparaphyllia .... *Hypnum* (p. 605)

177. Alar cells usually coloured yellow, orange or reddish 178

177. Alar cells hyaline and not coloured 180

178. Stem and branch tips with clusters of axillary brood branches .... *Platygyrium* (p. 593)

178. Stems and branches lacking brood branches 179

179. Stems with narrowly lanceolate, foliose pseudoparaphyllia; capsules long, usually 2 mm or more in length, exothecial cells noncollenchymatous; common .... *Callicladium* (p. 603)

179. Stems lacking pseudoparaphyllia; capsules short, seldom reaching 2 mm long, exothecial cells collenchymatous; rare .... *Sematophyllum* (p. 590)

180. Leaves long-decurrent, margins recurved .... *Plagiothecium denticulatum* (p. 583)

180. Leaves not or shortly decurrent, margins plane or incurved 181

181. Leaves falcate-secund; stems irregularly branched, branches few, seldom complanate .... *Hypnum* (p. 605)

181. Leaves not falcate-secund or only at tips of stems and branches; stems pinnately branched or with many branches, somewhat complanate .... *Callicladium* (p. 603)

Alar Cells Not Enlarged and Inflated

182. Plants large, stems often red, 10 cm long or more, pinnately or subpinnately branched 183

182. Plants small to medium-sized, stems green or sometimes red, usually less than 7 cm long, irregularly branched or sometimes pinnately branched 184

183. Plants pinnately branched with numerous, close branches, stems yellow, green or brown, leaves strongly falcate-secund, plicate .... *Ptilium* (p. 636)

183. Plants pinnately to subpinnately branched with distant branches, stems red, leaves falcate secund or squarrose, smooth or plicate .... *Rhytidiadelphus* (p. 640)

184. Plants complanate, leaves strongly undulate; capsules immersed; plants on tree trunks .... *Neckera pennata* (p. 428)

184. Plants not complanate or if so, leaves not strongly undulate; capsules exserted 185

185. Leaves falcate-secund; stems often pinnately branched; capsules arcuate, sometimes straight, contracted under mouth when dry .... *Hypnum* (p. 605)

185. Leaves straight or falcate but rarely falcate-secund; stems irregularly branched; capsules straight or rarely arcuate, sometimes contracted under mouth when dry 186

186. Plants small, leaves less than 1 mm long .... *Homomallium* (p. 601)

186. Plants medium-sized, leaves 1 mm long or more 187

187. Outer layer of stem cells large and thin-walled (best seen in cross-section) 188

187. Outer layers of stem cells small and thick-walled 189

188. Leaves entire to serrulate; minute, axillary gemmae sometimes present; capsules smooth or with a wrinkled neck .... *Isopterygium muellerianum* (p. 621)

188. Leaves serrulate to serrate; gemmae lacking; capsules striate .... *Herzogiella turfacea* (p. 630)

189. Stem and branch tips with clusters of brood bodies (branchlets) in leaf axils 190

189. Stems and branches lacking brood bodies 192

190. Leaf margins serrate near apex; plants on soil .... *Isopterygium* (p. 620)

190. Leaf margins entire or minutely serrulate; plants usually on wood 191

191. Median cells thick-walled, pitted, several rows of rounded, quadrate, or rectangular cells at base .... *Leucodon* (p. 411)

191. Median cells thin-walled, not pitted, few quadrate to rectangular cells at base .... *Platygyrium* (p. 593)

192. Alar cells quadrate, 5 or more on margins of some leaves, often numerous and in several rows 193

192. Alar cells mostly elongate, sometimes 2–3 quadrate cells in marginal row 196

193. Stems with numerous, short, crowded branches that are usually curved when dry; plants on tree trunks .... *Pylaisiella* (p. 596)

193. Stems lacking numerous short branches; plants on bases of trees or soil over rock 194

194. Leaf margins serrate to serrulate throughout; foliose pseudoparaphyllia present .... *Taxiphyllum* (p. 628)

194. Leaf margins entire to serrulate near apex; pseudoparaphyllia present or lacking 195

195. Plants complanate, many leaves rounded and apiculate; conspicuous foliose pseudoparaphyllia present .... *Neckera complanata* (p. 429)

195. Plants terete, leaves long-acuminate; pseudoparaphyllia lacking or inconspicuous .... *Entodon* (p. 577)

196. Plants complanate 197

196. Plants not complanate 198

197. Leaves decurrent, narrowed to an acute to acuminate apex; pseudoparaphyllia lacking; common .... *Plagiothecium* (p. 581)

197. Leaves nondecurrent, many leaves rounded and apiculate at apex; foliose pseudoparaphyllia present; rare .... *Neckera complanata* (p. 429)

198. Stems with numerous, short, crowded branches that are usually curved when dry; plants on tree trunks; common .... *Pylaisiella* (p. 596)

198. Stems lacking numerous short branches; plants on soil or soil over rock .... *Isopterygium* (p. 620)

Descriptions and Illustrations

Family SPHAGNACEAE

Sphagnum L., Spec. Pl. 1106. 1753.

Habit: In erect, often large, deep hummocks, sometimes prostrate and somewhat matted or floating.

Colour: Various shades of yellow, green, brown, red, purple and violet.

Stems: 4–30 cm or more in length, developed from a thallose protonema, erect or floating, simple, forked or usually with fascicles of 2–12 branches, spirally arranged around the stem, often crowded and shorter at stem tip in an enlarged tuft (capitulum), some branches divergent and spreading away from stem, others pendant and appressed to stem, often attenuate, epidermal cells of stem and branches sometimes with pores and fibrils, rhizoids lacking.

Leaves: Unistratose, spirally arranged, isophyllous or anisophyllous, stem leaves distant, erect and appressed to stem or spreading to hanging, straight, concave to nearly flat, spatulate, lingulate, elliptic or hastate, acute, obtuse or truncate, nondecurrent, branch leaves erect and imbricate or spreading to squarrose, sometimes 5-ranked, straight or arcuate, occasionally undulate and often reflexed or secund when dry, concave, lanceolate, ovate, ovate-lanceolate or ovate-hastate, truncate or cucullate, sometimes acute, nondecurrent. Perichaetial leaves sheathing base of pseudopodium, oblong-ovate, obtuse to acute.

Leaf Margins: Plane or involute, stem leaves entire to toothed at apex, sometimes fimbriate, lacerate or deeply cleft, occasionally lacerate to leaf middle, branch leaves toothed at apex, rarely entire, sometimes serrulate near apex.

Costae: Lacking.

Leaf Cells: Two kinds of cells present, (1) hyaline, large, rhomboidal, dead cells, without cell contents, somewhat cylindrical in cross-section, at least those on branch leaves of most species with pores and fibrils, alternating and forming a network with (2) green (chlorophyllose), small, linear, living cells, elliptic, triangular or trapezoidal in cross-section; all cells smooth or sometimes the hyaline walls adjacent to the chlorophyllose cells papillose or with comb fibrils, leaf margins usually bordered with 1–several rows of linear, thick-walled cells, the outer cell wall sometimes eroded, appearing furrowed in cross-section (resorption furrow).

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous or autoicous.

Calyptrae: Lacerate, membraneous, naked, covering capsule until maturity.

Capsules: Solitary, exserted on a short pseudopodium from or near stem apex, dark brown or black, globose, erect, smooth, urceolate or oblong-cylindric when dry, shortly exserted above the clasping perichaetial leaves; columella persistent.

Setae: Lacking. Capsule on pseudopodium that resembles a seta but is derived from the receptacle.

Annuli: Lacking.

Opercula: Convex.

Peristomes: Lacking.

Spores: Yellowish green to yellowish brown, tetrahedral with one large convex face and three smaller plane triangular ones, smooth or papillose, 19–41 μm in longest dimension.

Commonly called "Peat Moss" or "Bog Moss".

More detailed treatments of *Sphagnum*, which are especially helpful in the identification of the Maritime species, are those of Crum and Anderson (1981) and Andrus (1980b).

KEY TO SECTIONS

1. Branch leaves cucullate, roughened on dorsal surface near apex; cortical cells of stems and branches reinforced by spiral fibril-bands .... I. Section *Sphagnum* (p. 43)

1. Branch leaves not cucullate or if somewhat cucullate, lacking roughened apex; cortical cells of stems and branches lacking spiral fibril-bands 2

2. Cortical cells of branches uniform, all retort cells; branch leaves broadly truncate .... II. Section *Rigida* (p. 51)

2. Cortical cells of branches of two types of cells, some retort cells and some aporose cells; branch leaves narrowly truncate, rarely broadly truncate 3

3. Branches numerous, 6–13 per fascicle .... VII. Section *Polyclada* (p. 77)

3. Branches fewer, 2–6 per fascicle 4

4. Branch leaf hyaline cells efibrillose .... IV. Section *Isocladus* (p. 57)

4. Branch leaf hyaline cells fibrillose 5

5. Leaves isophyllous or nearly so; branches few, 2–3 per fascicle .... VI. Section *Subsecunda* (in part) (p. 73)

5. Leaves anisophyllous, stem and branch leaves usually differently shaped; branches many, 3–6 per fascicle 6

6. Chlorophyllose cells of branch leaves in cross-section exposed more broadly on the ventral surface; plants often with some red or purple pigmentation .... VIII. Section *Acutifolia* (p. 79)

6. Chlorophyllose cells of branch leaves in cross-section exposed more broadly on the dorsal surface or equally on both surfaces; plants often with brown pigmentation but never red or purple 7

7. Stem leaves lingulate, fimbriate at apex; branch leaves often squarrose from an enlarged clasping base; hyaline cells of branch leaves with large, numerous pores on both ventral and dorsal surfaces, the walls adjacent to chlorophyllose cells often finely papillose .... III. Section *Squarrosa* (p. 54)

7. Stem leaves triangular, ovate, spatulate or lingulate, entire or fimbriate to erose at apex; branch leaves not squarrose; hyaline cells of branch leaves with small pores, often only on one surface, the walls smooth 8

8. Branch leaves often undulate or variously contorted or recurved on margins and at apex when dry; hyaline cells of branch leaves lacking pores or pores not long commissures; chlorophyllose cells of branch leaves triangular to trapezoidal in cross-section, exposed more broadly on dorsal surface .... V. Section *Cuspidata* (p. 59)

8. Branch leaves not undulate or contorted, the margins and apices not recurved; hyaline cells of branch leaves with many pores along commissures; chlorophyllose cells of branch leaves truncately elliptic to trapezoidal in cross-section, exposed equally on both surfaces or broader on dorsal surface .... VI. Section *Subsecunda* (in part) (p. 73)

I. Section *Sphagnum*

(Synonym: *Palustria*)

Branch leaves cucullate-concave, roughened on dorsal surface near apex (due to resorption of hyaline cells); cortical cells of stems and branches reinforced by spiral fibril-bands; end pores on dorsal surface of hyaline cells of branch leaves commonly in 2's and 3's at adjacent angles.

1. Plants with a reddish or purplish colour .... 1. *S. magellanicum* (in part)
1. Plants lacking reddish or purplish colour, usually various shades of green or brown 2
    2. Branch leaf hyaline cells with papillae or comb-fibrils on walls adjacent to chlorophyllose cells (best seen in lower part of leaf either in cross-section or surface view) 3
        3. Branch leaf hyaline cells with comb-fibrils on walls; chlorophyllose cells of branch leaf triangular in cross-section .... 5. *S. imbricatum*
        3. Branch leaf hyaline cells with papillae on walls; chlorophyllose cells of branch leaf truncately elliptic or trapezoidal in cross-section .... 4. *S. papillosum*
    2. Branch leaf hyaline cells with smooth walls 4
        4. Branch leaf chlorophyllose cells triangular in cross-section, the base exposed on the ventral surface .... 3. *S. palustre*
        4. Branch leaf chlorophyllose cells elliptic in cross-section, central or nearly so, and enclosed on both surfaces by hyaline cells 5
            5. Walls of hyaline cells with gaps between adjacent cells on both dorsal and ventral surfaces (seen in surface view) .... 2. *S. centrale*
            5. Walls of hyaline cells in contact throughout their length on both surfaces .... 1. *S. magellanicum* (in part)

1. Sphagnum magellanicum Brid., Musc. Rec. 2(1): 24. 1798.
[Synonym: *S. medium* Limpr.]
PLATE 8

Plants medium-sized to large, reddish or purplish, sometimes light green in shade. Stem leaves lingulate-spatulate, apex fimbriate, denticulate on sides. Branches in fascicles of 4–6, with 2–3 divergent. Branch leaves appressed to somewhat spreading, broadly ovate, denticulate at apex, chlorophyllose cells elliptic in cross-section, central, enclosed on both surfaces by hyaline cells, walls of hyaline cells smooth.

Habitat: In hummocks in open areas of bogs, sometimes in fens.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, Madawaska, Saint John, Victoria, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: *Greenland to Alaska, south to Florida, *Texas, *Idaho, and *California. *West Indies, Central and South America, Europe, Asia, *Africa, *Australia.

Chromosome Number: n = ca. 17–19, 19, 19 + 3.

Remarks: When the reddish or purplish pigmentation is absent in *S. magellanicum* a microscopic examination is necessary to differentiate the plants from the others in the *Sphagnum* section. The smooth walls of the branch leaf hyaline cells will easily distinguish it from *S. imbricatum* whose walls have comb-fibrils and *S. papillosum* whose walls have papillae. The elliptic (in cross-section) and centrally located chlorophyllose cells will separate it from *S. palustre* whose triangular shaped cells are exposed on the ventral surface. Close observation of the branch leaf cell structure on both the upper and lower surfaces will eliminate the necessity of cutting cross-sections since the chlorophyllose cells can be seen on the upper surface of *S. palustre* plants. *Sphagnum centrale* can be difficult to distinguish but again examination of both surfaces of the branch leaves is critical. The walls of the hyaline cells are with gaps between the adjacent cells on both surfaces in *S. centrale* which contrasts with those of *S. magellanicum* which has the walls of the hyaline cells in contact throughout their length on both surfaces.

2. Sphagnum centrale C. Jens. *ex* H. Arnell & C. Jens., Bih. K. Svensk. Vet. Ak. Handl. 21 Afd. 3(10): 34. 1896.
PLATE 9

Plants medium-sized to large, whitish green to yellowish or light brown. Stem leaves lingulate-spatulate, apex fimbriate, denticulate on sides. Branches in fascicles of 4–6, with 2–3 divergent. Branch leaves appressed to spreading or sometimes slightly squarrose, broadly ovate, denticulate at apex, chlorophyllose cells lenticular to elliptic, often more exposed on ventral surface, walls of hyaline cells smooth.

Habitat: In hummocks in coniferous woods and wooded fens.

Maritime Distribution: Frequent. Nova Scotia (Digby, Inverness, Lunenburg, Saint Paul Island); Prince Edward Island (Queens).

Range: Newfoundland to Alaska, south to *West Virginia, *Indiana, Illinois, Wisconsin, Iowa, and *Washington. Europe.

Chromosome Number: n = ca. 38, 38 + ?.

Remarks: See discussion under *S. magellanicum*.

3. Sphagnum palustre L., Spec. Pl. 1106. 1753.
[Synonym: *S. cymbifolium* Hedw.]
PLATE 10

Plants medium-sized to large, green to yellowish brown or brown. Stem leaves lingulate-spatulate, apex fimbriate, denticulate on sides. Branches in fascicles of 4–5, with 2 divergent. Branch leaves appressed to spreading or sometimes slightly squarrose, broadly ovate, denticulate at apex, chlorophyllose cells triangular to ovate-triangular, base exposed on ventral surface, walls of hyaline cells smooth.

Habitat: Often at margins of bogs and ponds, sometimes in fens and in wet depressions in shaded coniferous woods.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Northumberland, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Halifax, Hants, Inverness, Kings, Shelburne, Victoria, Yarmouth, Sable Island); Prince Edward Island (Kings, Queens).

Range: In the East from Labrador to Ontario, south to Florida, Alabama, Mississippi, Louisiana, and Texas; in the West from *Alaska and British Columbia, south to California. Mexico, *South America, Europe, Asia, Pacific Islands.

Chromosome Number: n = 38, 38 + ?, 38 + 4.

Remarks: For distinction from *S. centrale* and green forms of *S. magellanicum*, see under the latter. See under *S. papillosum* for possible confusion with forms of that species.

4. Sphagnum papillosum Lindb., Act. Soc. Sci. Fenn. 10: 280. 1872.
PLATE 11

Plants medium-sized to large, brown or rarely green. Stem leaves lingulate-spatulate, apex fimbriate, denticulate on sides. Branches in fascicles of 4–5, with 2 divergent. Branch leaves appressed to slightly spreading, broadly ovate, denticulate at apex, chlorophyllose cells truncately elliptic or trapezoidal in cross-section, equally exposed or more broadly exposed on the ventral surface, walls of hyaline cells adjacent to chlorophyllose cells with small papillae.

Habitat: In hummocks and mats in wet open bogs and fens, frequently at margins of lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, Queen's, Sunbury, York); Nova Scotia (Annapolis, Colchester, Guysborough, Halifax, Inverness, Lunenburg, Richmond, Shelburne, Victoria); Prince Edward Island (Kings).

Range: In the East from *Greenland to Ontario, south to North Carolina, Michigan, Wisconsin, and *Minnesota; in the West from Alaska, south to Oregon. *South America, Europe, Asia, *New Zealand.

Chromosome Number: n = 19, 38 + 4.

Remarks: The papillae on the walls of the hyaline cells of the branch leaves are small and sometimes difficult to see, especially in cross-section. They are best observed at the base of the branch leaves, either dorsal or ventral surface, by close examination of the chlorophyllose cells. Nonpapillose forms of *S. papillosum*, which are reported to exist throughout North America, have not been seen in the Maritimes but they would be difficult to tell from *S. palustre*. If ever encountered, they can be distinguished by the stem leaf hyaline cells that are once divided (usually near leaf middle or below) in *S. papillosum* and only rarely divided in *S. palustre*.

5. Sphagnum imbricatum Hornsch. *ex* Russ., Arch. Naturk. Livl. Ehstl. Kurl. ser. 2, 7: 99. 1865.
PLATE 12

Plants medium-sized to large, green or brownish. Stem leaves lingulate-spatulate, apex fimbriate, denticulate on sides. Branches in fascicles of 4–5, with 2 divergent. Branch leaves appressed to somewhat spreading, broadly ovate, denticulate at apex, chlorophyllose cells triangular in cross-section, base exposed on ventral surface, walls of hyaline cells adjacent to chlorophyllose cells with comb-fibrils.

Habitat: In hummocks in bogs and fens, sometimes at margins of lakes and in thickets along streams.

Maritime Distribution: Frequent. New Brunswick (Charlotte, St. John, Sunbury); Nova Scotia (Annapolis, Guysborough, Halifax, Kings, Richmond, Shelburne, Victoria, Cape Breton, Sable Island).

Range: A suboceanic species, occurring in eastern North America from Newfoundland, south to Florida, Mississippi, Louisiana, and Texas; in the West from Alaska, south to British Columbia; also in Northwest Territories, Tennessee, *Indiana, *Oklahoma, *Ontario (?), and *Quebec (?). *West Indies, Central and *South America, Europe, *Asia.

Chromosome Number: n = 19.

Remarks: The comb-fibrils are best observed at the base of the branch leaves and they can easily be seen in surface view or cross-section.

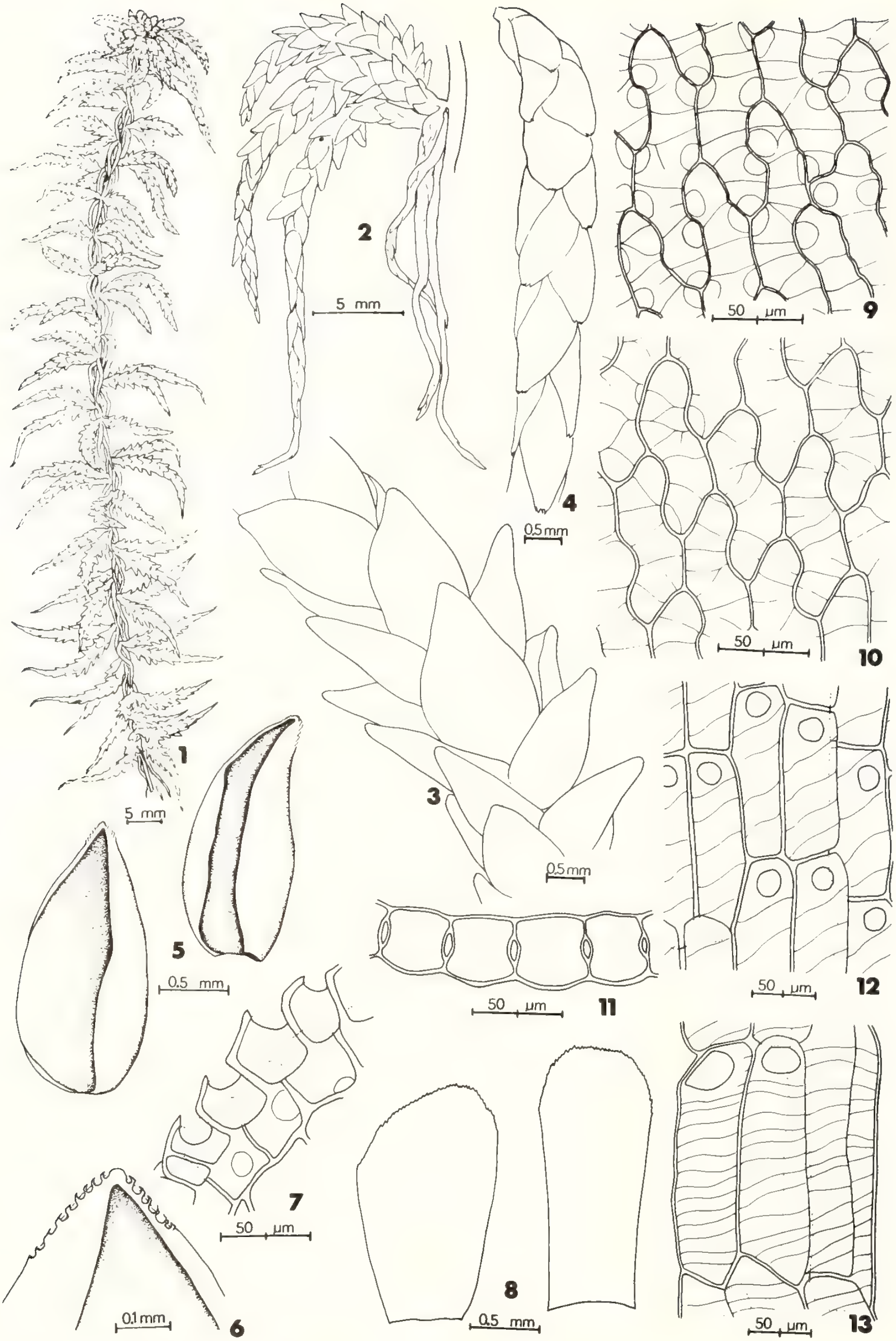
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Plate 8. *Sphagnum magellanicum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Portion of hanging branch. 5. Branch leaves. 6. Apex of branch leaf. 7. Dorsal cells of branch leaf apex showing resorption. 8. Stem leaves. 9. Median cells of branch leaf (dorsal surface). 10. Median cells of branch leaf (ventral surface.). 11. Cross-section of median cells of branch leaf. 12. Outer cortical cells of stem showing spiral fibril-bands. 13. Outer cortical cells of branch showing spiral fibril-bands.

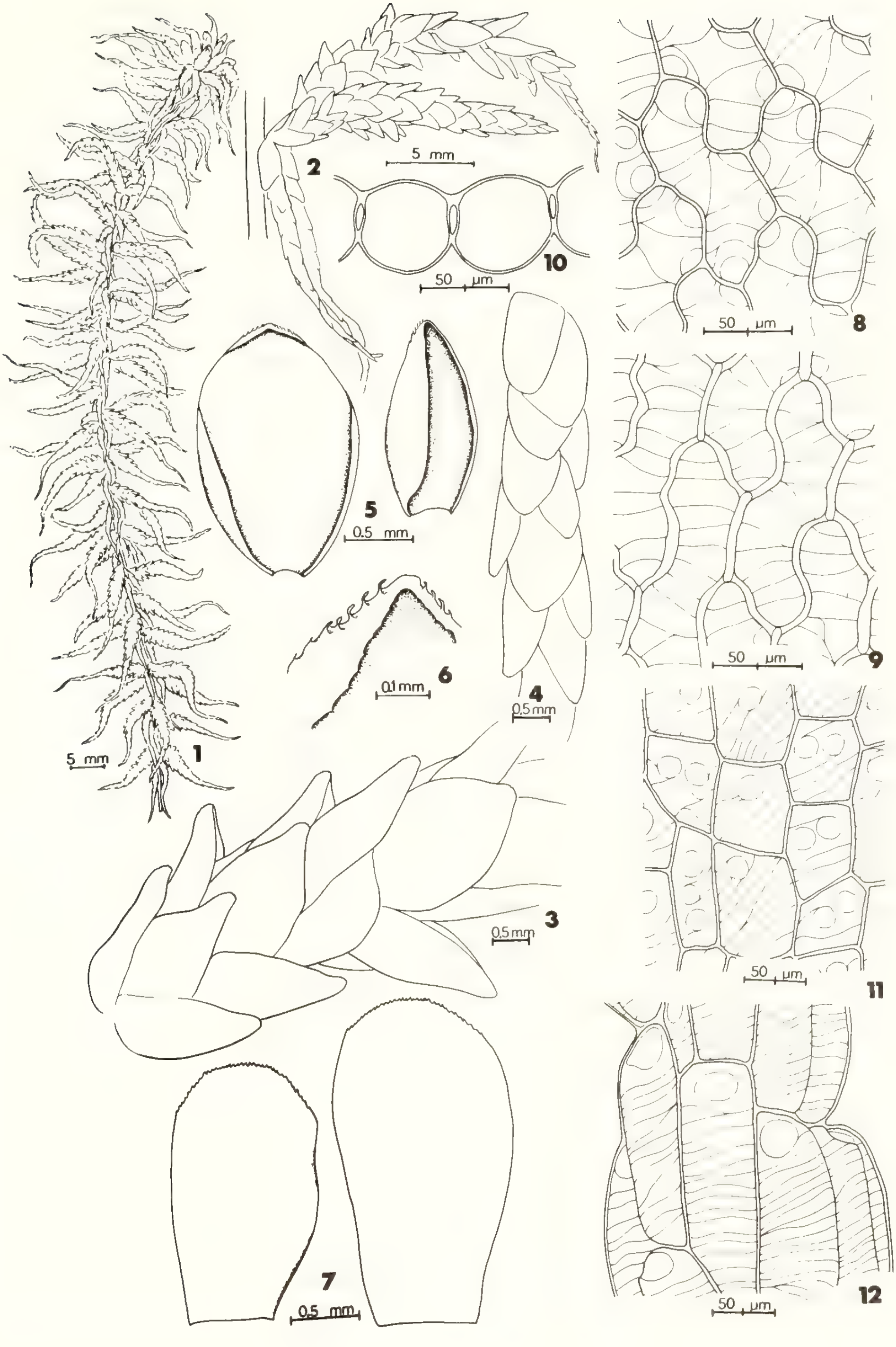
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Plate 9. *Sphagnum centrale*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Portion of hanging branch. 5. Branch leaves. 6. Apex of branch leaf. 7. Stem leaves. 8. Median cells of branch leaf (dorsal surface). 9. Median cells of branch leaf (ventral surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem showing spiral fibril-bands. 12. Outer cortical cells of branch showing spiral fibril-bands.

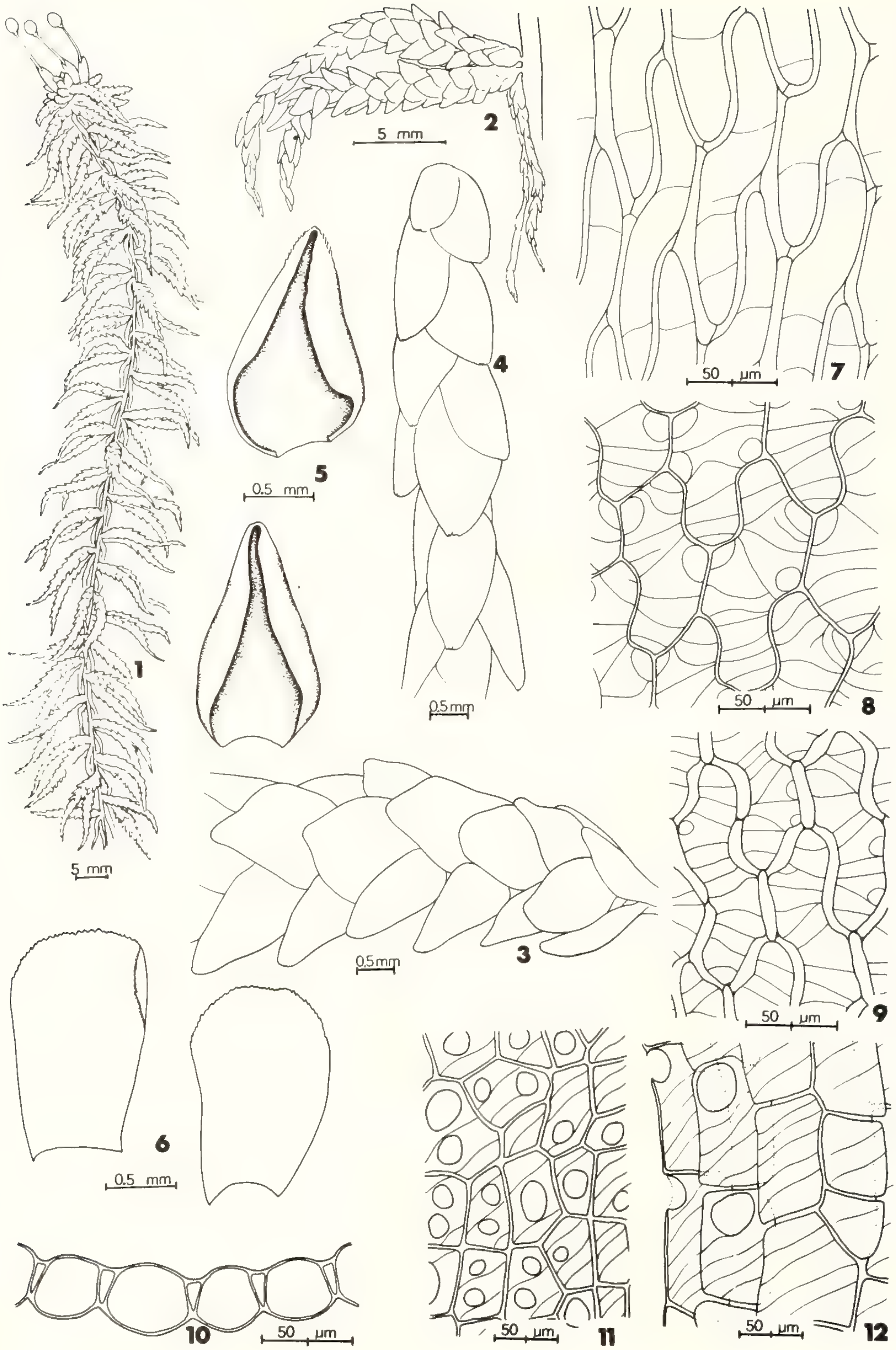
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Plate 10. *Sphagnum palustre*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Portion of hanging branch. 5. Branch leaves. 6. Stem leaves. 7. Median cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Median cells of branch leaf (ventral surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem showing spiral fibril-bands. 12. Outer cortical cells of branch showing spiral fibril-bands.

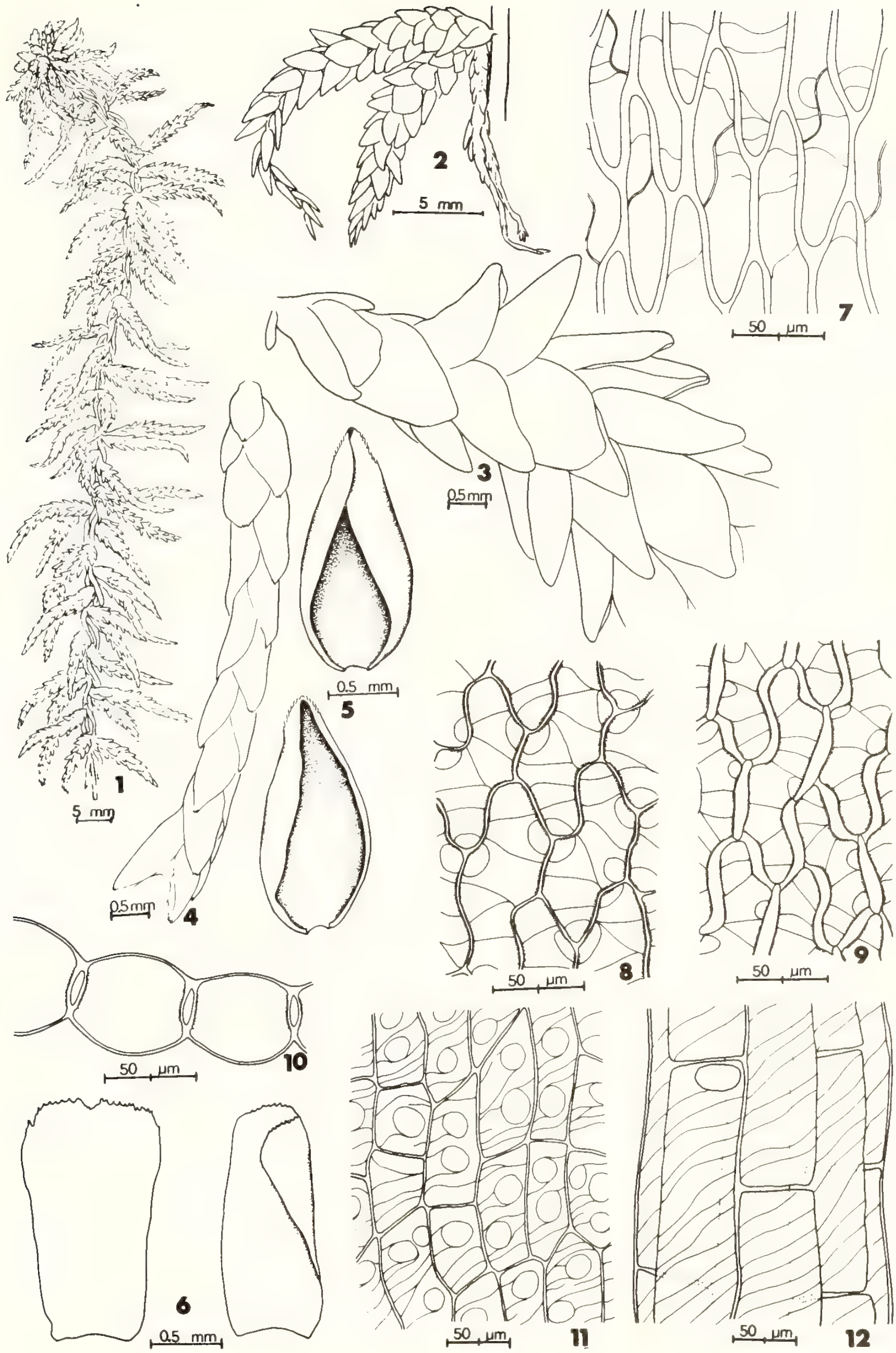
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Plate 11. *Sphagnum papillosum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Portion of hanging branch. 5. Branch leaves. 6. Stem leaves. 7. Median cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Median cells of branch leaf (ventral surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem showing spiral fibril-bands. 12. Outer cortical cells of branch showing spiral fibril-bands.

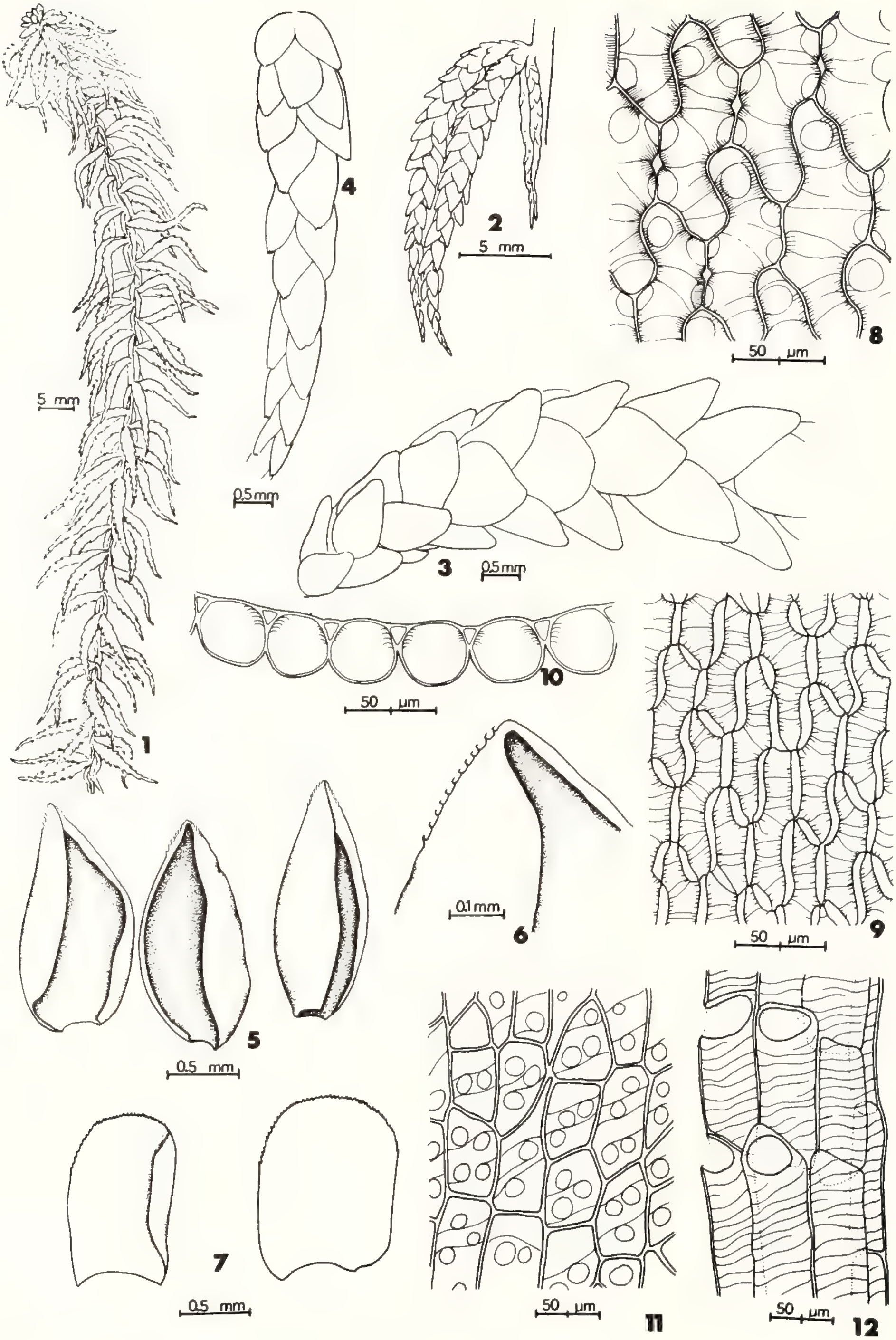
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Plate 12. *Sphagnum imbricatum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Portion of hanging branch. 5. Branch leaves. 6. Apex of branch leaf. 7. Stem leaves. 8. Median cells of branch leaf (dorsal surface). 9. Median cells of branch leaf (ventral surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem showing spiral fibril-bands. 12. Outer cortical cells of branch showing spiral fibril-bands.

II. Section *Rigida*

Cortical cells of branches retort-shaped, ± uniform throughout; stem leaves small; branch leaves broadly truncate.

1. Chlorophyllose cells of branch leaves enclosed on both surfaces (seen in cross-section), the walls of adjacent hyaline cells smooth; pseudopores present on dorsal surface of hyaline cells of branch leaves; stems dark brown with age .... 6. *S. compactum*
1. Chlorophyllose cells of branch leaves enclosed on the concave surface but reaching the convex surface (seen in cross-section), the walls of adjacent hyaline cells often minutely papillose; pseudopores lacking; stems pale brown or green .... 7. *S. strictum*

6. Sphagnum compactum DC. *ex* Lam. & DC., Fl. Franc., ed. 2, 2: 443. 1805.
[Synonyms: *S. compactum* var. *imbricatum* Warnst.; *S. compactum* var. *squarrosum* (Russ.) Warnst.]
PLATE 13

Plants small to medium-sized, usually compact, light green, yellowish green or yellowish brown. Stem leaves triangular-lingulate or lingulate-spatulate, apex weakly fimbriate, denticulate on sides. Branches in fascicles of 4–5, with 2 divergent, sometimes stems nearly simple. Branch leaves appressed and imbricate to squarrose, ovate to ovate-hastate, involute, apex broadly truncate, concave to slightly cucullate, toothed, chlorophyllose cells elliptic in cross-section, central, enclosed on both surfaces by hyaline cells, walls of hyaline cells smooth, pseudopores present on dorsal surface of hyaline cells of branch leaves.

Habitat: In open bogs, in wet drainage ditches, on sandy soil beside ponds and rarely in rock crevices in boulders in woods.

Maritime Distribution: Frequent. New Brunswick (Kent, Queen's, Restigouche); Nova Scotia (Annapolis, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to *Georgia, Alabama, Arkansas, Manitoba, Saskatchewan, Alberta, and Washington. South America, Europe, Asia, *Africa, *Australia.

Chromosome Number: $n = 19+2, 19+2-4$.

Remarks: The plants are remarkably variable in branching and phyllotaxy. The typical form (Figs. 1–10) is compact with branches in fascicles of 4–5 and leaves slightly spreading. A form referred to as the var. *squarrosum* (Russ.) Warnst. (Figs. 13–14) is less compact and it has branching similar to the typical variety but with squarrose leaves. The oddest plants are what has been named var. *imbricatum* Warnst. (Figs. 11–12) which has mostly imbricate leaves and very few branches that do not appear to be in fascicles. The latter form often occurs in cracks of boulders and this may account for its nearly simple stems. Both varieties, var. *squarrosum* and var. *imbricatum*, seem to be habitat forms and I include them within the var. *compactum*.

7. Sphagnum strictum Sull., Musci Allegh. 201. 1845.
PLATE 14

Plants medium-sized, open or sometimes somewhat compact, light green, whitish green or yellowish brown. Stem leaves triangular-lingulate or lingulate-spatulate, apex entire or weakly fimbriate, entire or denticulate on sides. Branches in fascicles of 4–5, with 2 divergent. Branch leaves strongly squarrose, ovate to elongate-ovate, involute, apex broadly truncate, toothed chlorophyllose cells ovate to ovate-triangular in cross-section, enclosed on ventral surface, narrowly to broadly exposed with a thickened end-wall on dorsal surface, walls of hyaline cells adjacent to chlorophyllose cells papillose, pseudopores lacking.

Habitat: At stream margins and in drainage ditches.

Maritime Distribution: Rare. New Brunswick (Westmorland); Nova Scotia (Annapolis, Halifax).

Range: Predominantly an oceanic species, occurring on the East coast of North America from *Labrador and Newfoundland, south to Florida, Alabama and *Louisiana; also in Arkansas. *West Indies, *South America, Europe.

Chromosome Number: $n = 19+3$.

Remarks: Resembling small forms of *S. squarrosum* superficially but the branch leaves have narrow apices in that species. Squarrose forms of *S. compactum* are difficult to separate from *S. strictum* but the difference in the branch leaf chlorophyllose cells in cross-section, as well as the presence or absence of pseudopores and papillae on the walls of the hyaline cells, will distinguish them.

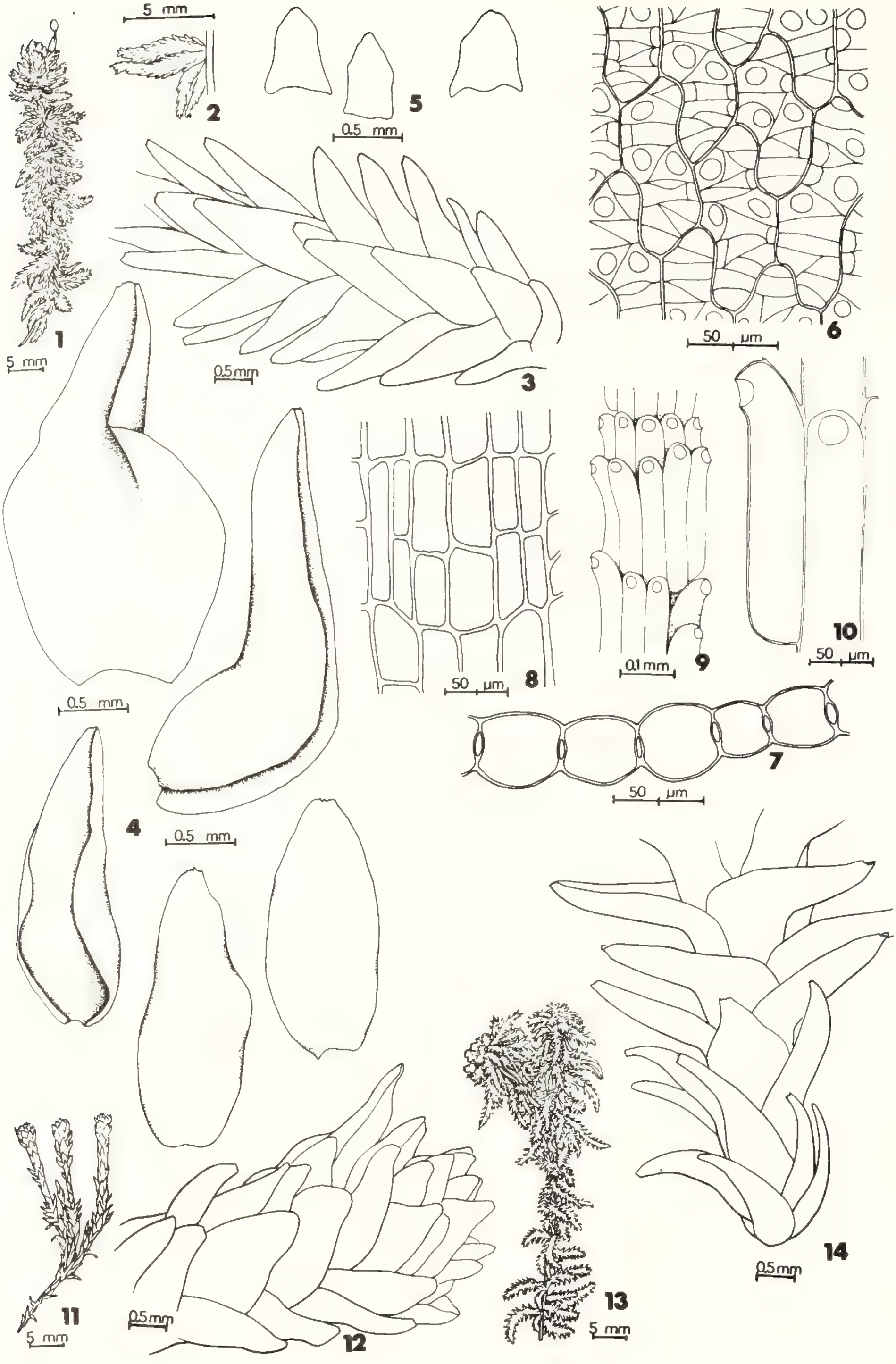
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Plate 13. *Sphagnum compactum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Median cells of branch leaf (dorsal surface) showing pseudopores. 7. Cross-section of median cells of branch leaf. 8. Outer cortical cells of stem. 9–10. Outer cortical cells of branch showing retort cells. 11–12. *Sphagnum compactum* "var. *imbricatum*" form. 11. Habit. 12. Portion of divergent branch. 13–14. *Sphagnum compactum* "var. *squarrosum*" form. 13. Habit. 14. Portion of divergent branch.

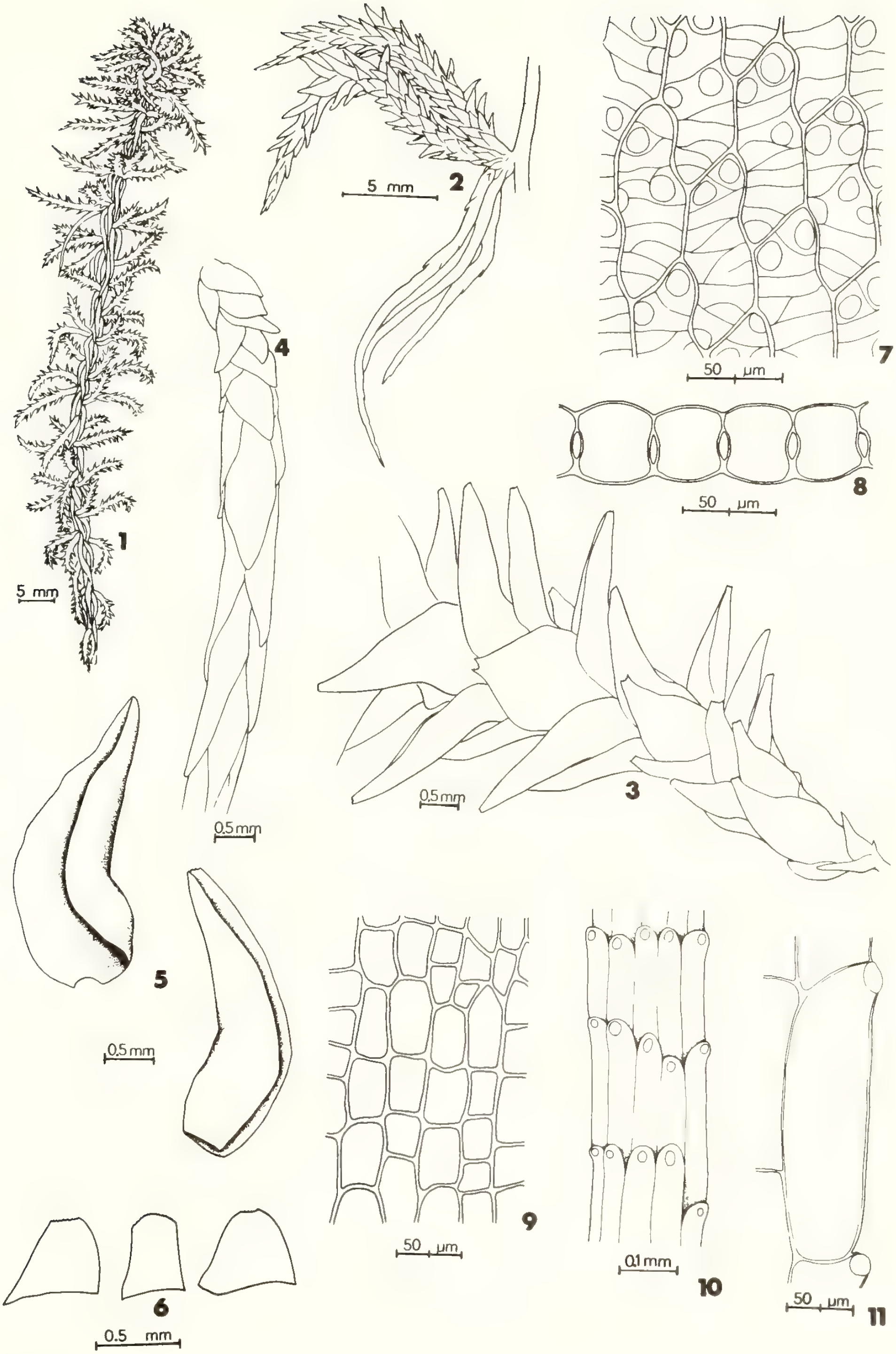
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Plate 14. *Sphagnum strictum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Portion of hanging branch. 5. Branch leaves. 6. Stem leaves. 7. Median cells of branch leaf (dorsal surface). 8. Cross-section of median cells of leaf. 9. Outer cortical cells of stem. 10–11. Outer cortical cells of branch showing retort cells.

III. Section *Squarrosa*

Leaves anisophyllous; stem leaves lingulate, fimbriate to erose at rounded apex; branch leaves imbricate to spreading or strongly squarrose, at least when dry; hyaline cells of branch leaves with large pores, those on ventral surface ringed, walls of hyaline cells adjacent to chlorophyllose cells usually finely papillose; chlorophyllose cells of branch leaves triangular to trapezoidal in cross-section, exposed exclusively or more broadly on the dorsal surface.

1. Plants large, robust, branch leaves often over 1 mm wide, squarrose from a broad, erect, clasping base .... 8. *S. squarrosum*
1. Plants medium-sized and slender, branch leaves mostly 1 mm wide or less, erect and imbricate, rarely somewhat spreading or squarrose, not differentiated at base .... 9. *S. teres*

8. Sphagnum squarrosum Crome, Samml. Deutsch, Laubm. 24. 1803.
PLATE 15

Plants large and robust, light green, yellowish-green or -brown. Stem leaves ovate- or oblong-lingulate, apex fimbriate to erose. Branches in fascicles of 4–5, with 2–3 divergent. Branch leaves squarrose wet or dry, ovate-hastate, base erect, enlarged, clasping, abruptly narrowed to an involute, acute, toothed apex, chlorophyllose cells triangular to trapezoidal in cross-section, more broadly exposed on dorsal surface, walls of hyaline cells adjacent to chlorophyllose cells often finely papillose.

Habitat: In wet depressions in coniferous woods, at margins of streams, and in swampy *Thuja* woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Restigouche, Saint John, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Inverness, Kings, Lunenburg, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south in the mountains to *North Carolina and *Tennessee; also in *Ohio, Michigan, *Illinois, Minnesota, Colorado, Idaho, *Arizona, and *California. Europe, Asia, *Africa.

Chromosome Number: n = 19, 19 + 2, 19 + 2 – 4, 19 + 4.

Remarks: A common, predominantly woodland species recognizable even in the field by its large size, its light green or yellowish green colour and its abruptly narrowed, strongly squarrose branch leaves.

9. Sphagnum teres (Schimp.) Ångstr. *ex* C. Hartm., Handb. Skand. Fl. ed. 8: 417. 1861.
Sphagnum squarrosum var. *teres* Schimp., Vers. Entwickl. Torfm. 64. 1858.
PLATE 16

Plants medium-sized and slender, yellowish- or brownish-green. Stem leaves oblong-lingulate, apex fimbriate to erose. Branches in fascicles of 4–5, with 2–3 divergent. Branch leaves imbricate or spreading to squarrose at tips when dry, ovate to ovate-lanceolate, not differentiated at base, involute near apex, usually narrowly truncate, toothed at apex, chlorophyllose cells triangular to trapezoidal in cross-section, more broadly exposed on dorsal surface, walls of hyaline cells adjacent to chlorophyllose cells often finely papillose.

Habitat: In alkaline bogs (rich fens).

Maritime Distribution: Rare. Nova Scotia (Inverness, Victoria).

Range: Greenland to Alaska, south to *Pennsylvania, *Ohio, Michigan, Illinois, *Iowa, *North Dakota, Colorado, Idaho, and *California. Europe, *Asia.

Chromosome Number: n = 19 + 2, 19 + 4.

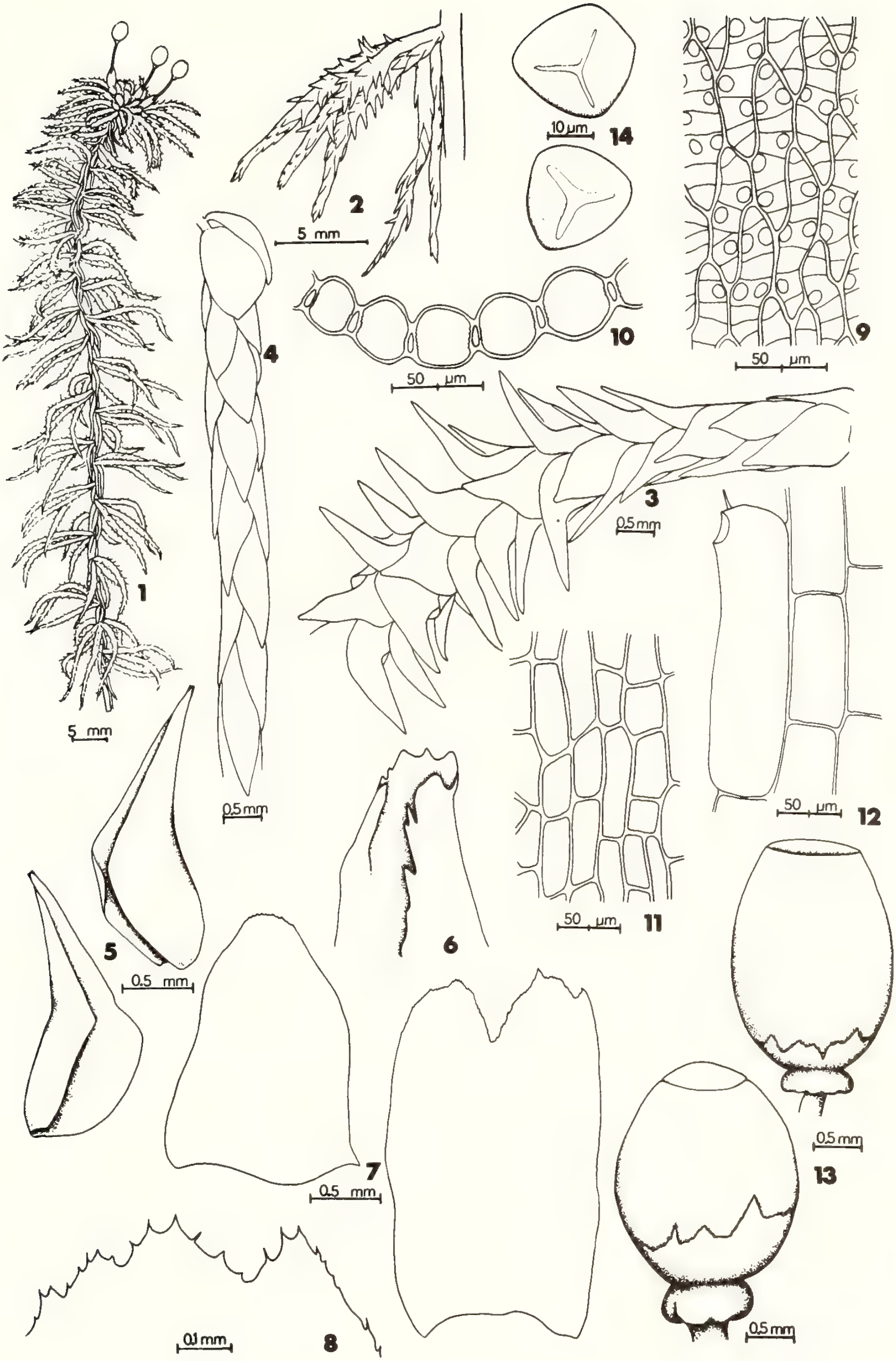
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Plate 15. *Sphagnum squarrosum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Portion of hanging branch. 5. Branch leaves. 6. Apex of branch leaf. 7. Stem leaves. 8. Apex of stem leaf. 9. Median cells of branch leaf (ventral surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell. 13. Capsules showing torn calyptrae; operculate (wet), inoperculate (dry). 14. Spores.

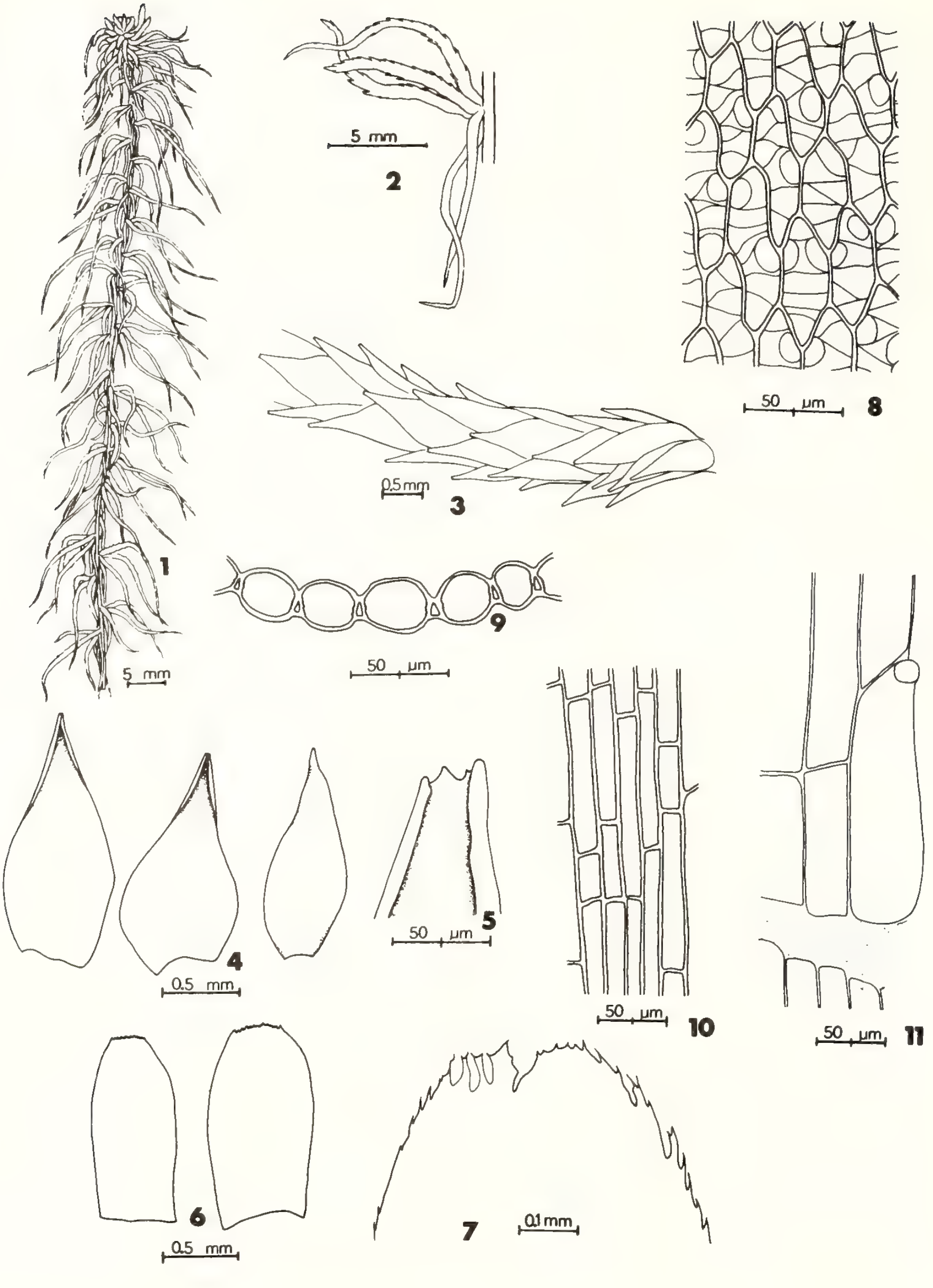
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Plate 16. *Sphagnum teres*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Apex of branch leaf. 6. Stem leaves. 7. Apex of stem leaf. 8. Median cells of branch leaf (ventral surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

IV. Section *Isocladus*

Branch leaf hyaline cells efibrillose.

A monotypic section containing an unusual endemic species.

10. Sphagnum macrophyllum Bernh. *ex* Brid., Bryol. Univ. 1: 10. 1826.

PLATE 17

Plants large, whitish green, yellowish green or brown, often with a metallic gloss when dry. Stem leaves triangular-lingulate, entire or nearly so. Branches in fascicles of 1–3, with 1–2 divergent. Branch leaves spreading, often tufted near ends of branches, lanceolate to linear-lanceolate, tubulose, entire or with a few teeth at apex, hyaline cells efibrillose, chlorophyllose cells elliptic to rectangular in cross-section, equally exposed on both surfaces, walls of hyaline cells smooth.

Habitat: Often floating or submerged at margins of lakes.

Maritime Distribution: Frequent. Nova Scotia (Annapolis, Guysborough, Halifax, Hants, Lunenburg, Queens, Shelburne).

Range: Endemic to eastern North America, from southern *Newfoundland, south to Florida, Mississippi, Louisiana, and *Texas; also in eastern *Tennessee.

Chromosome Number: Unreported.

Remarks: A peculiar species that macroscopically resembles a grass or a sedge more than a *Sphagnum*. Microscopically, its cell structure distinguishes it from any grass-like plant and it differs from all other Sphagna in the Maritimes by the lack of fibrils on the hyaline cells of the branch leaves.

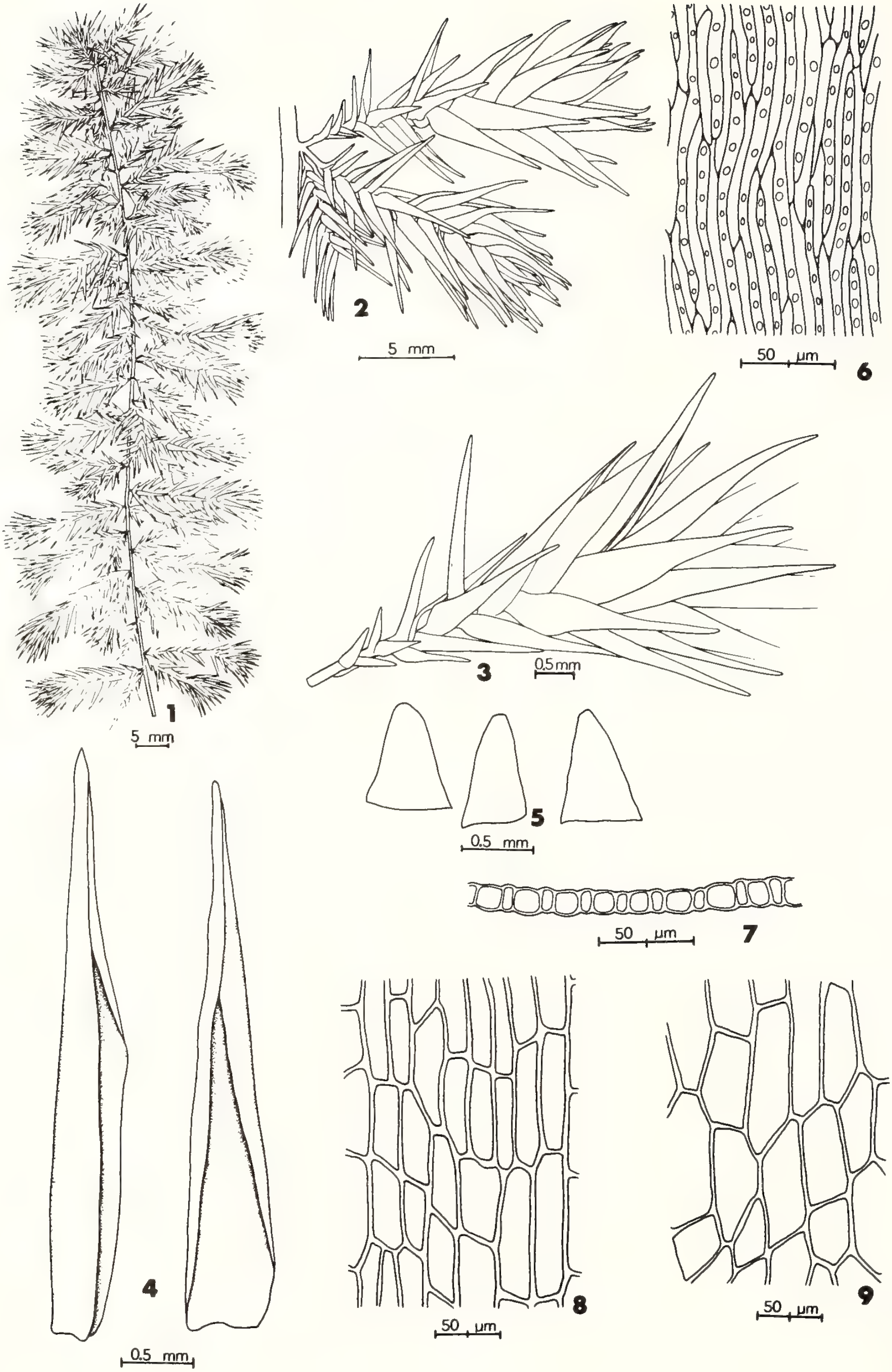
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Plate 17. *Sphagnum macrophyllum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Median cells of branch leaf (dorsal surface). 7. Cross-section of median cells of branch leaf. 8. Outer cortical cells of stem. 9. Outer cortical cells of branch.

V. Section *Cuspidata*

Plants mainly of wet habitats, often with brown pigmentation, never pink, red or purple; leaves anisophyllous; stem leaves bordered by linear cells, the border much broader below; hyaline cells of branch leaves variously porose on one or both surfaces with ringed or unringed pores; chlorophyllose cells of branch leaves in cross-section exposed more broadly on dorsal surface.

1. Branch leaves broadly ovate, seldom more than twice as long as wide, not twisted or undulate when dry, apex seldom recurved; retort cells long-necked .... 14. *S. tenellum*
1. Branch leaves lanceolate to ovate-lanceolate, much longer than wide, often twisted and undulate with recurved apex when dry; retort cells not long-necked 2
    2. Stem leaves lacerate or deeply cleft at apex 3
        3. Stem leaves lacerate across apex; stem dark brown .... 20. *S. lindbergii*
        3. Stem leaves deeply cleft at apex; stem yellowish to green .... 19. *S. riparium*
    2. Stem leaves entire to slightly erose at apex 4
        4. Branch leaves long, mostly over 4 times as long as wide 5
            5. Branch leaf hyaline cells on dorsal surface with pores free from commissures .... 13. *S. majus* (in part)
            5. Branch leaf hyaline cells on dorsal surface with pores along commissures 6
                6. Branch leaves broad, often 1 mm wide; stem leaves usually obtuse .... 12. *S. torreyanum*
                6. Branch leaves narrow, usually less than 0.8 mm wide; stem leaves usually acute .... 11. *S. cuspidatum*
        4. Branch leaves short, seldom reaching 4 times as long as wide 7
            7. Stem leaves acute 8
                8. Branch leaves broad, conspicuously 5-ranked; plants often brownish .... 15. *S. pulchrum*
                8. Branch leaves not 5-ranked or indistinctly so; plants green to yellowish, seldom brown .... 16. *S. fallax*
            7. Stem leaves obtuse, rarely acute 9
                9. Branch tips curved, the leaves falcate-secund; hyaline cells of branch leaves with numerous pores on dorsal surface, the pores in indistinct rows over the surface .... 13. *S. majus* (in part)
                9. Branch tips not curved, the leaves not falcate-secund; hyaline cells of branch leaves with few pores on dorsal surface, the pores often in the cell angles 10
                    10. Stem leaves weakly denticulate at apex; margins of branch leaves not recurved when dry .... 17. *S. angustifolium*
                    10. Stem leaves slightly erose at apex; margins of branch leaves recurved when dry .... 18. *S. flexuosum*

11. Sphagnum cuspidatum Ehrh. *ex* Hoffm., Deutschl. Fl. 2: 22. 1796.
[Synonym: *S. cuspidatum* var. *serrulatum* (Schlieph.) Schlieph.]
PLATE 18

Plants medium-sized to large, often flexuose and delicate, green or yellowish green. Stem leaves triangular-ovate, apex acute, entire, hyaline cells undivided, fibrillose near apex. Branches in fascicles of 4–5, with 2–3 divergent. Branch leaves erect-spreading, often falcate-secund near branch tips, loose, becoming close and imbricate at branch tips, contorted and often undulate on margins when dry, lanceolate to ovate-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with few pores along commissures.

Habitat: Often submerged in pools and depressions in bogs and at margins of lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent); Nova Scotia (Annapolis, Digby, Guysborough, Halifax, Inverness, Kings, Richmond, Shelburne, Victoria, Sable Island); Prince Edward Island (Kings).

Range: *Labrador to Ontario, south to Georgia, Michigan, *Wisconsin, and *Minnesota; also in *Alaska. Central and South America, Europe, Asia, *Africa, *Australia, *New Zealand, *Pacific Islands.

Chromosome Number: n = 19+2, 19+3−4.

Remarks: A species that is best known by its nature of growing submerged in pools and depressions in bogs and at margins of lakes. The plants are weak and limp when removed from the water and the branch leaves tend to stick together like an artist's brush as Crum (1976) notes.

12. Sphagnum torreyanum Sull., Mem. Amer. Acad. Arts Sci. n. ser. 4: 174. 1849.
[Synonym: *S. cuspidatum* var. *torreyi* (Sull.) Braithw.]
PLATE 19

Plants large, robust, green, yellowish green, yellowish brown or brown. Stem leaves triangular-lingulate, apex acute to obtuse, entire, hyaline cells undivided or divided, efibrillose. Branches in fascicles of 4–5, with 2–3 divergent. Branch leaves erect-spreading, often falcate-secund, especially at branch tips, loose, becoming close and imbricate at branch tips, undulate on margins when dry, long-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with few pores along commissures.

Habitat: Submerged in water in fens, at margins of ponds and lakes and in wet roadside ditches.

Maritime Distribution: Frequent. New Brunswick (Queen's); Nova Scotia (Annapolis, Guysborough, Halifax, Inverness, Lunenburg, Shelburne, Victoria).

Range: Endemic to oceanic parts of eastern North America, occurring from Newfoundland to Quebec, south to North Carolina and Louisiana.

Chromosome Number: n = 38.

13. Sphagnum majus (Russ.) C. Jens., Festskr. Bot. For. Kjoebenh. 106: 33. 1890.
Sphagnum cuspidatum var. *majus* Russ., Arch. Naturk. Livl. Ehstl. Kurl. ser. 2, 7: 136. 1865.
[Synonym: *S. dusenii* Warnst.]
PLATE 20

Plants medium-sized to large, green to dark brown. Stem leaves triangular-lingulate, apex obtuse, entire, hyaline cells undivided, fibrillose near apex. Branches in fascicles of 4–5, with 2 divergent. Branch leaves imbricate to erect-spreading, often falcate-secund, especially at branch tips, close to loose, contorted and somewhat undulate on margins when dry, ovate-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with numerous pores in indistinct rows, usually free from commissures.

Habitat: In pools and wet depressions in bogs and fens.

Maritime Distribution: Frequent. New Brunswick (Charlotte, Kent, Northumberland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Guysborough, Halifax, Inverness, Lunenberg, Richmond).

Range: Labrador to Alaska, south to *Virginia, Michigan, Wisconsin, *Minnesota, and British Columbia. Europe, *Asia.

Chromosome Number: n = 19+4, 38.

14. Sphagnum tenellum (Brid.) Pers. *ex* Brid., Musc. Rec. Suppl. 4: 1. 1819.
Sphagnum cymbifolium var. *tenellum* Pers. *ex* Brid., Musc. Rec. 2(1): 24. 1798.
[Synonym: *S. molluscum* Bruch]
PLATE 21

Plants small, pale yellow to yellowish-green or -brown. Stem leaves ovate-lingulate, concave, apex obtuse or nearly so, entire or with a few denticulations, hyaline cells undivided, fibrillose in upper half of leaf. Branches in fascicles of 1–5, with 1–3 divergent. Branch cortex with long-necked retort cells. Branch leaves erect-spreading, loose, not twisted or undulate when dry, ovate, concave, apex acute to narrowly truncate, toothed, hyaline cells on dorsal surface with pores at apical ends and at angles.

Habitat: In wet depression and pools in open bogs.

Maritime Distribution: Common. New Brunswick (Alberta, Charlotte, Saint John); Nova Scotia (Cape Breton, Digby, Halifax, Inverness, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings).

Range: A suboceanic species occurring in eastern North America from Labrador to northern Ontario, south to North Carolina; in western North America from Alaska to British Columbia. Doubtfully in *Alberta, *Manitoba, and *Saskatchewan. *South America, Europe, Asia.

Chromosome Number: n = 19, 19+2.

Remarks: One of the most distinct species in the section *Cuspidata* because of the ovate, concave branch leaves that are nearly as broad as long and do not become twisted and contorted when dry like the other *Cuspidata*. Also, the retort cells of the branches are distinctly long-necked in comparison to the others in the section.

15. Sphagnum pulchrum (Lindb. *ex* Braithw.) Warnst., Bot. Centralbl. 82: 42. 1900.

Sphagnum intermedium var. *pulchrum* Lindb. *ex* Braithw., Sphagn. Eur. N. Amer. 81. 1880.

PLATE 22

Plants medium-sized to large, moderately robust, green, yellowish green, yellowish brown or often brown. Stem leaves triangular to triangular-lingulate, apex acute, involute, entire, hyaline cells undivided, efibrillose. Branches in fascicles of 4–5, with 2 divergent. Branch leaves 5-ranked, glossy when dry, imbricate to erect-spreading, undulate and reflexed on margins when dry, broadly ovate to ovate-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with pores at ends and angles.

Habitat: In open, wet places in fens and bogs.

Maritime Distribution: Frequent. New Brunswick (Kent, Sunbury); Nova Scotia (Annapolis, Cape Breton, Colchester, Guysborough, Halifax, Inverness, Victoria).

Range: In eastern North America from Labrador to Ontario, south to New Jersey, New York, Michigan, and *Wisconsin; known in western North America from *Alberta and British Columbia. Europe, *Asia.

Chromosome Number: n = 19.

Remarks: The large, usually brownish plants, with 5-ranked, broad leaves, with a glossy appearance when dry, help in the recognition of this *Sphagnum*.

16. Sphagnum fallax (Klinggr.) Klinggr., Schrift. Naturf. Ges. Danzig. ser. 2, 5(1): 209. 1881.

Sphagnum cuspidatum var. *fallax* Klinggr., Schrift. Phys. Oek. Ges. Königsberg 13:7. 1872.

[Synonym: *S. recurvum* auct., *non* P. Beauv.]

PLATE 23

Plants medium-sized to large, green, yellowish green or yellowish brown, rarely brown. Stem leaves triangular to oblong-triangular, apex acute, entire, hyaline cells undivided, efibrillose. Branches in fascicles of 4–5, with 2 divergent. Branch leaves imbricate to erect-spreading, contorted and undulate with recurved tips when dry, lanceolate to ovate-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with few pores at ends and angles.

Habitat: In open fens and bogs, sometimes at margins of boggy forests and in wet depressions in forests.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, Madawaska, Northumberland, Saint John, Sunbury, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: *Greenland to Alaska, south to North Carolina, Michigan, Wisconsin, Minnesota, *Missouri, *Nebraska, *Colorado, and *California. Central and South America, Europe, *Asia.

Chromosome Number: n = 19, 19+?, 19+2, 19+4.

Remarks: Probably the most common of all the *Cuspidata*. Easier to recognize when dry rather than wet because of the contorted and undulate branch leaves with recurved tips.

17. Sphagnum angustifolium (C. Jens. *ex* Russ.) C. Jens., Bih. K. Svensk. Vet. Ak. Handl. Afd. 3, 16:48. 1891.

Sphagnum recurvum subsp. *angustifolium* C. Jens. *ex* Russ., Sitzungsber. Naturf. Ges. Dorpat 9: 99. 1890.

[Synonyms: *S. recurvum* var. *tenue* Klinggr., *S. parvifolium* (Warnst.) Warnst.]

PLATE 24

Plants small to medium-sized, green, yellowish green or yellowish brown. Stem leaves triangular, apex broadly acute to obtuse, weakly denticulate, hyaline cells undivided, efibrillose. Branches in fascicles of 4–5, with 2 divergent. Branch leaves imbricate to erect-spreading, slightly contorted and undulate with recurved tips when dry, lanceolate to ovate-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with few pores at angles.

Habitat: In wooded coniferous fens.

Maritime Distribution: Rare or often overlooked. New Brunswick (Restigouche); Nova Scotia (Halifax).

Range: Newfoundland to Alaska, south to *West Virginia, Michigan, Wisconsin, *Minnesota, *Nebraska, *Montana, *Utah, *Idaho, and *Oregon. Europe.

Chromosome Number: n = 19+4−5.

Remarks: A segregate species of *S. fallax* that can be confused with it, as well as another species, *S. flexuosum*. Andrus (1980b) notes that *S. angustifolium* sometimes has pink stems, whereas *S. fallax* and *S. flexuosum* have green or yellowish stems.

18. Sphagnum flexuosum Dozy & Molk., Prodr. Fl. Batav. 2(1): 76. 1851.

[Synonyms: *S. recurvum* var. *amblyphyllum* (Russ.) Warnst., *S. amblyphyllum* (Russ.) Warnst.]

PLATE 25

Plants small to medium-sized, green, yellowish green or yellowish brown. Stem leaves triangular-lingulate to lingulate, apex obtuse, fimbriate to erose, hyaline cells undivided, efibrillose or rarely fibrillose. Branches in fascicles of 4–5, with 2 divergent. Branch leaves imbricate to erect-spreading, contorted and undulate with recurved margins when dry, ovate-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with few pores at ends and angles.

Habitat: In hummocks and fens and at margins of ponds.

Maritime Distribution: Rare. New Brunswick (Northumberland); Prince Edward Island (Queens).

Range: New Brunswick and Prince Edward Island to *Ontario, south to *West Virginia and Minnesota. Europe, Asia.

Chromosome Number: Unreported.

Remarks: Compare with *S. angustifolium* and *S. fallax*.

19. Sphagnum riparium Ångstr., Oefv. K. Vet. Ak. Foerh. 21: 198. 1864.

PLATE 26

Plants medium-sized to large, moderately robust, green, yellowish green or yellowish brown. Stem leaves oblong-triangular or triangular-lingulate, apex broad, deeply cleft, hyaline cells divided, efibrillose. Branches in fascicles of 4–5, with 2 divergent. Branch leaves imbricate to slightly erect-spreading, weakly undulate and abruptly recurved at apex when dry, ovate-lanceolate, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with pores at ends and angles.

Habitat: In fens, at margins of ponds and lakes, and occasionally in wet roadside ditches.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Saint John); Nova Scotia (Cumberland, Halifax); Prince Edward Island (Prince).

Range: Greenland to Alaska, south to New Hampshire, New York, Michigan, *Wisconsin, *Minnesota, and *Washington. Europe, *Asia.

Chromosome Number: n = 19+4.

Remarks: The deeply cleft stem leaves is the most obvious feature that will help to identify the species. The turgid branches with gradually narrowed leaves that have recurved tips when dry are also distinctive.

20. Sphagnum lindbergii Schimp. *ex* Lindb., Oefv. K. Vet. Ak. Foerh. 14: 126. 1857.

PLATE 27

Plants medium-sized to large, robust, green, yellowish brown or brown, with brown stems. Stem leaves spatulate, apex broad, lacerate, hyaline cells sometimes divided in upper half of leaf, efibrillose. Branches in fascicles of 4–5, with 2 divergent. Branch leaves imbricate to erect-spreading, close to loose, undulate on margins when dry, ovate-lanceolate, somewhat concave, apex narrowly truncate, involute, toothed, hyaline cells on dorsal surface with pores at ends and angles.

Habitat: In depressions and pools in fens.

Maritime Distribution: Frequent. New Brunswick (Charlotte, Saint John); Nova Scotia (Guysborough, Halifax, Inverness).

Range: Greenland to Alaska, south to New Hampshire, New York, and British Columbia. *South America, Europe, *Asia.

Chromosome Number: n = 19, 19+4.

Remarks: The dark brown stems and the lacerate stem leaves will readily distinguish *S. lindbergii* from the other *Cuspidata*.

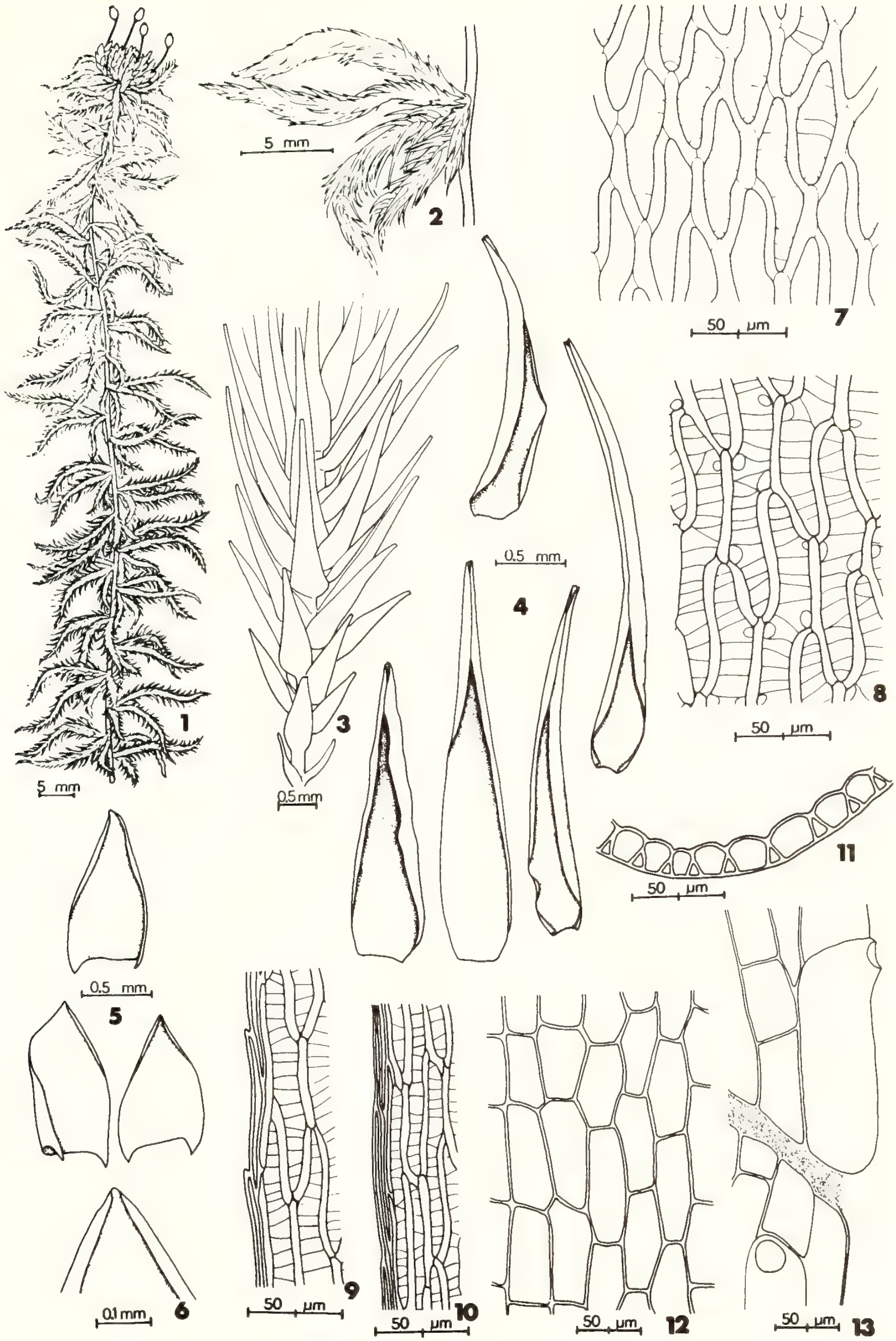
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Plate 18. *Sphagnum cuspidatum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9–10. Median-marginal cells of branch leaves. 11. Cross-section of median cells of branch leaf. 12. Outer cortical cells of stem. 13. Outer cortical cells of branch showing retort cell.

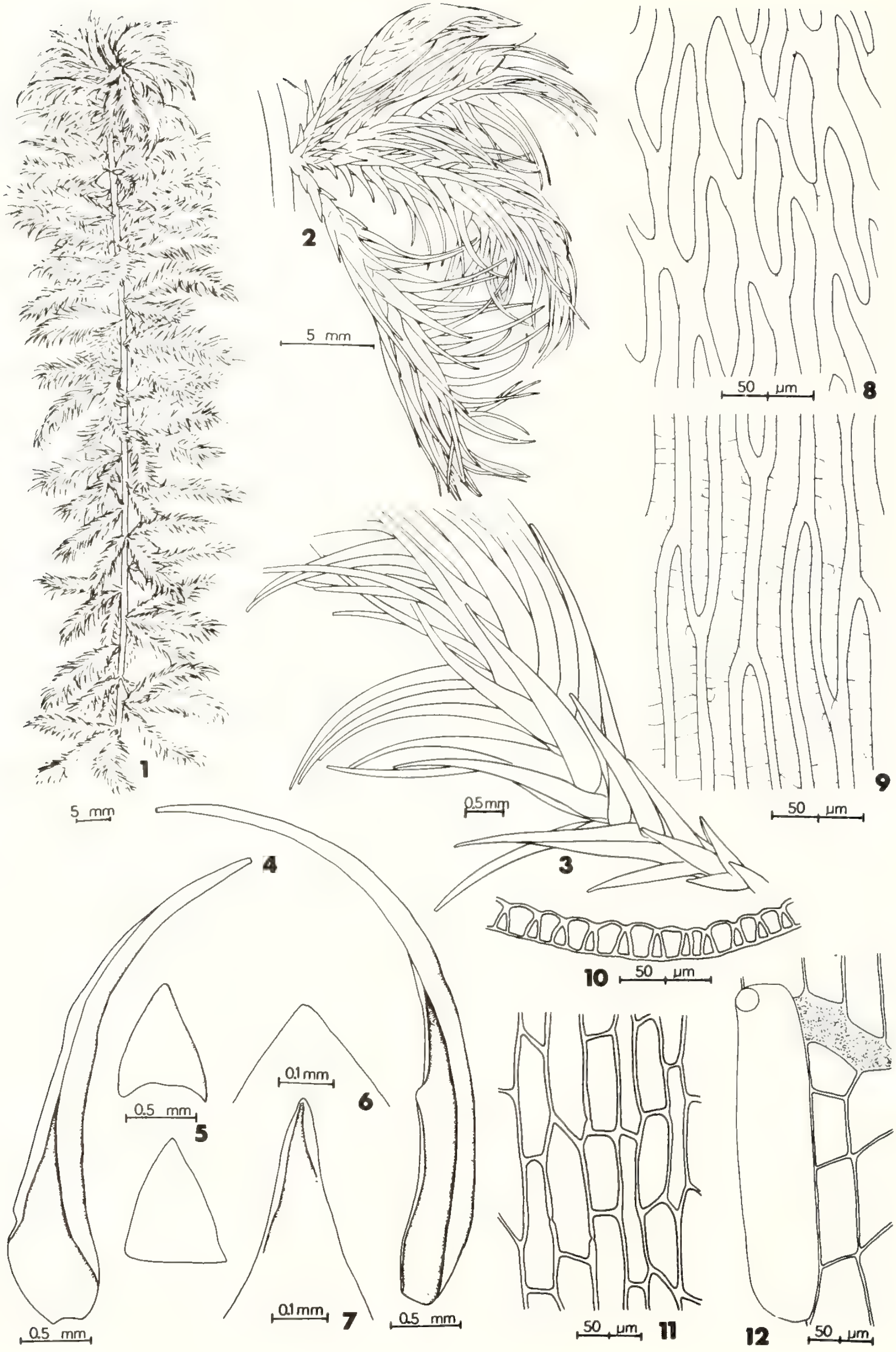
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Plate 19. *Sphagnum torreyanum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6–7. Apices of stem leaves. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell.

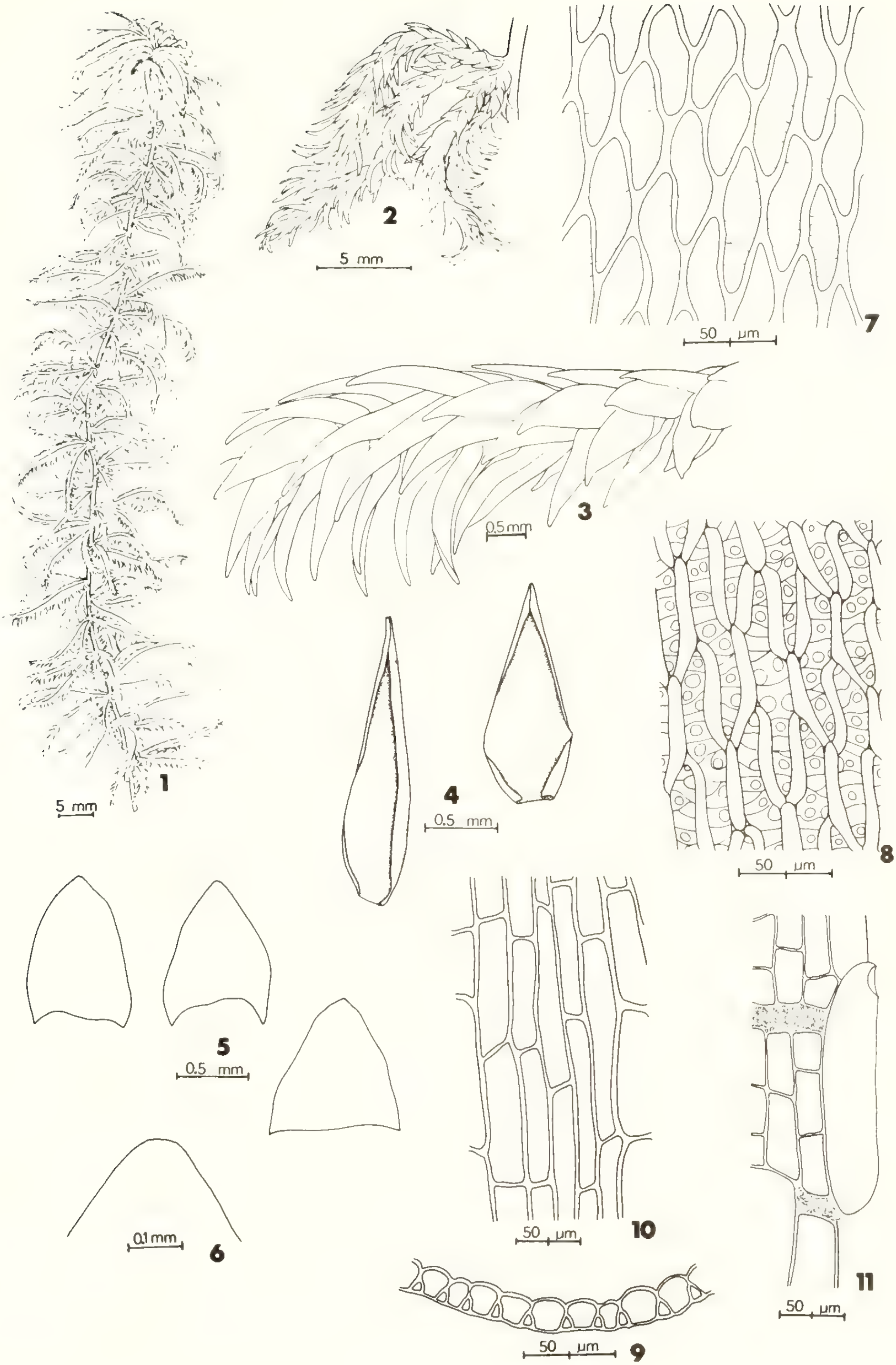
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Plate 20. *Sphagnum majus*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

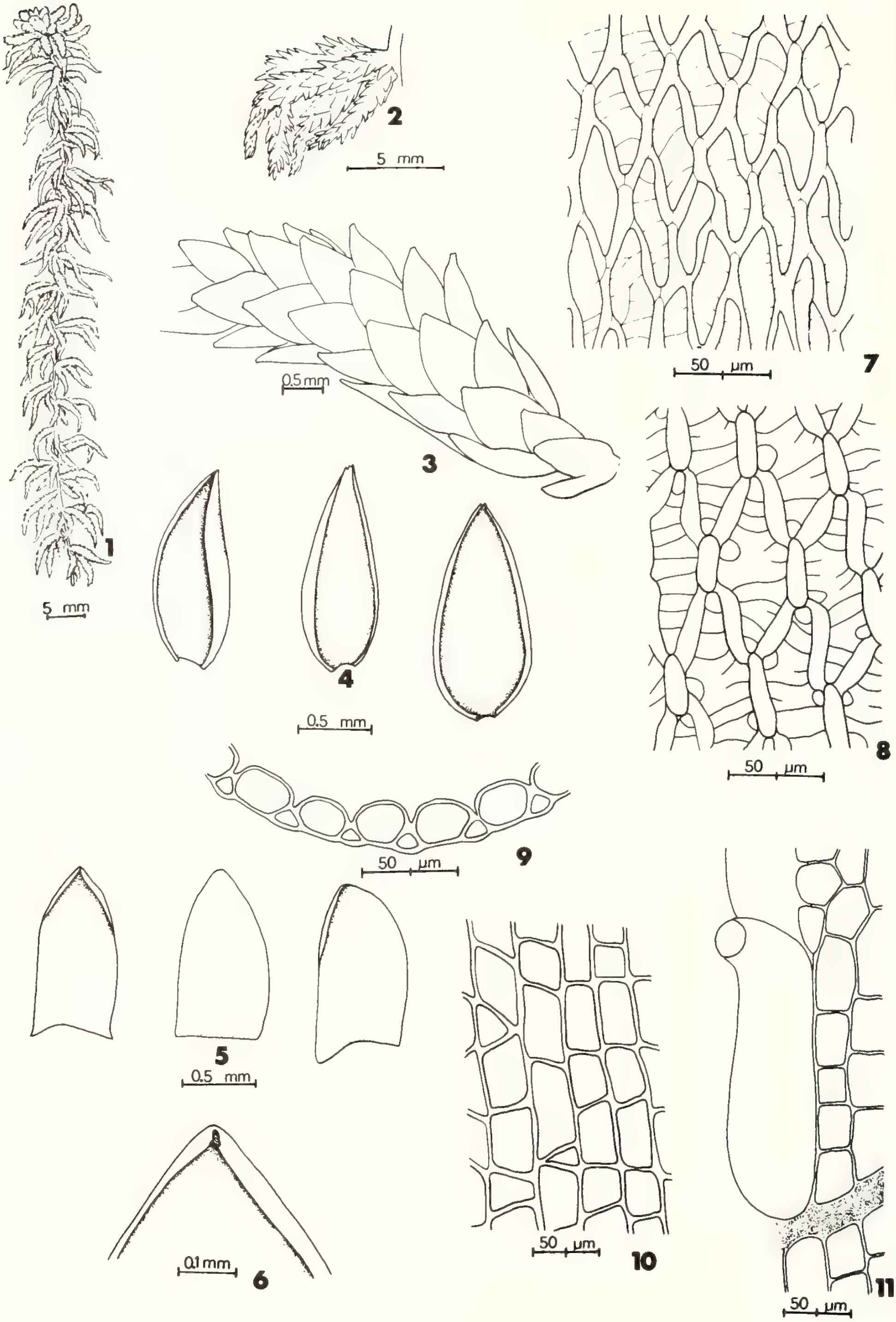
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Plate 21. *Sphagnum tenellum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

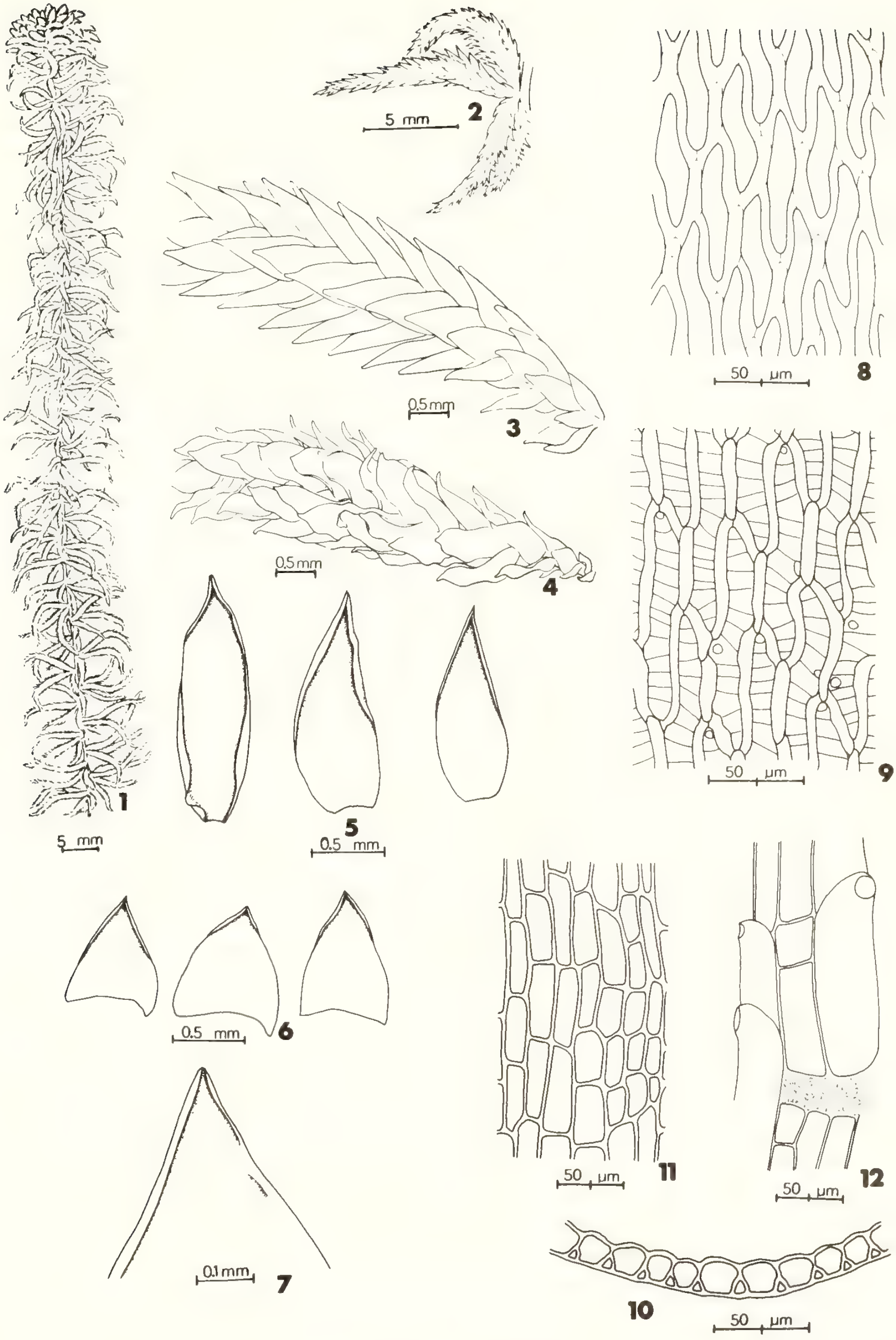
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Plate 22. *Sphagnum pulchrum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch (wet). 4. Portion of divergent branch (dry). 5. Branch leaves. 6. Stem leaves. 7. Apex of stem leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cells.

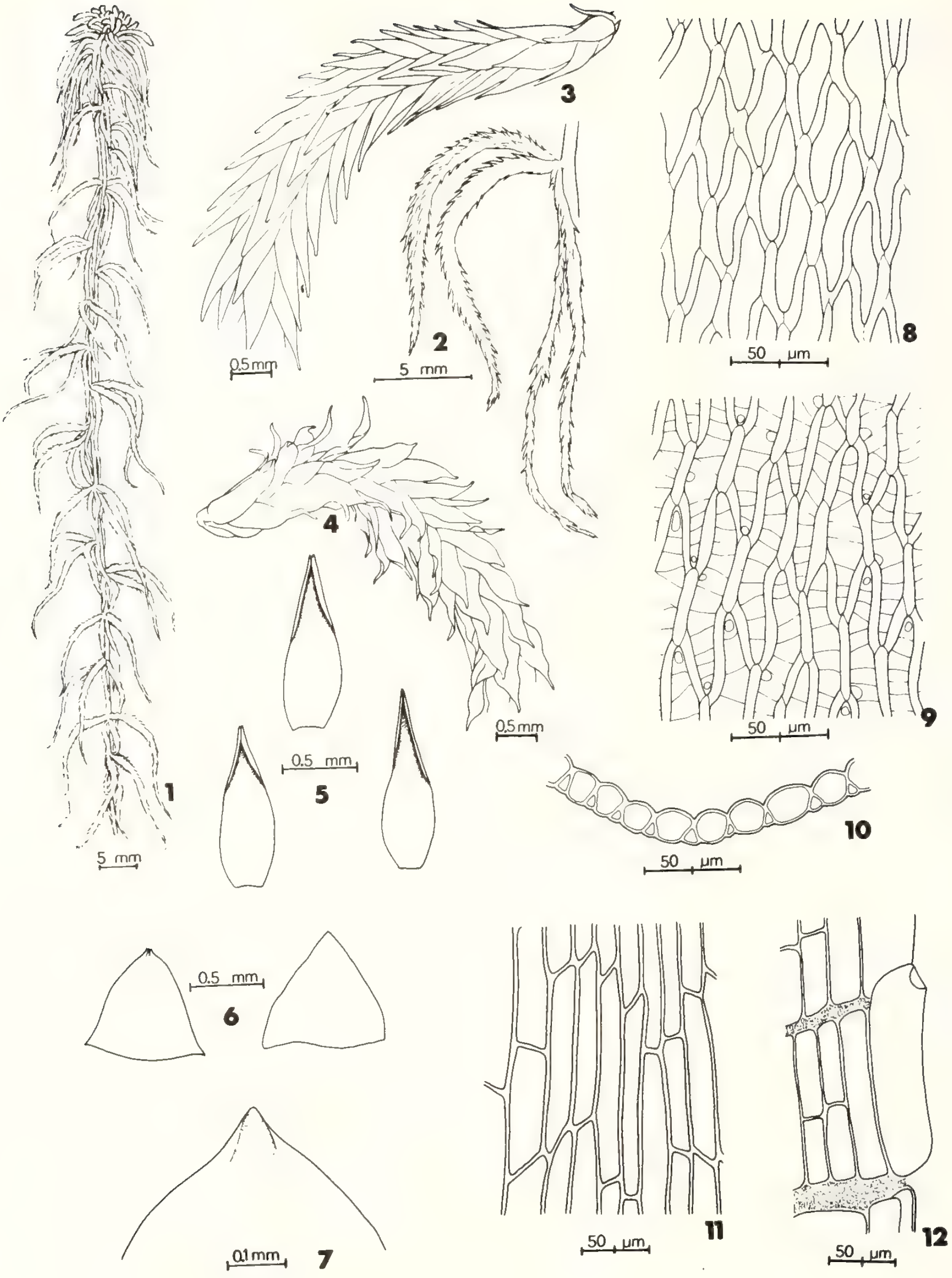
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Plate 23. *Sphagnum fallax*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch (wet). 4. Portion of divergent branch (dry). 5. Branch leaves. 6. Stem leaves. 7. Apex of stem leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Cortical cells of branch showing retort cell.

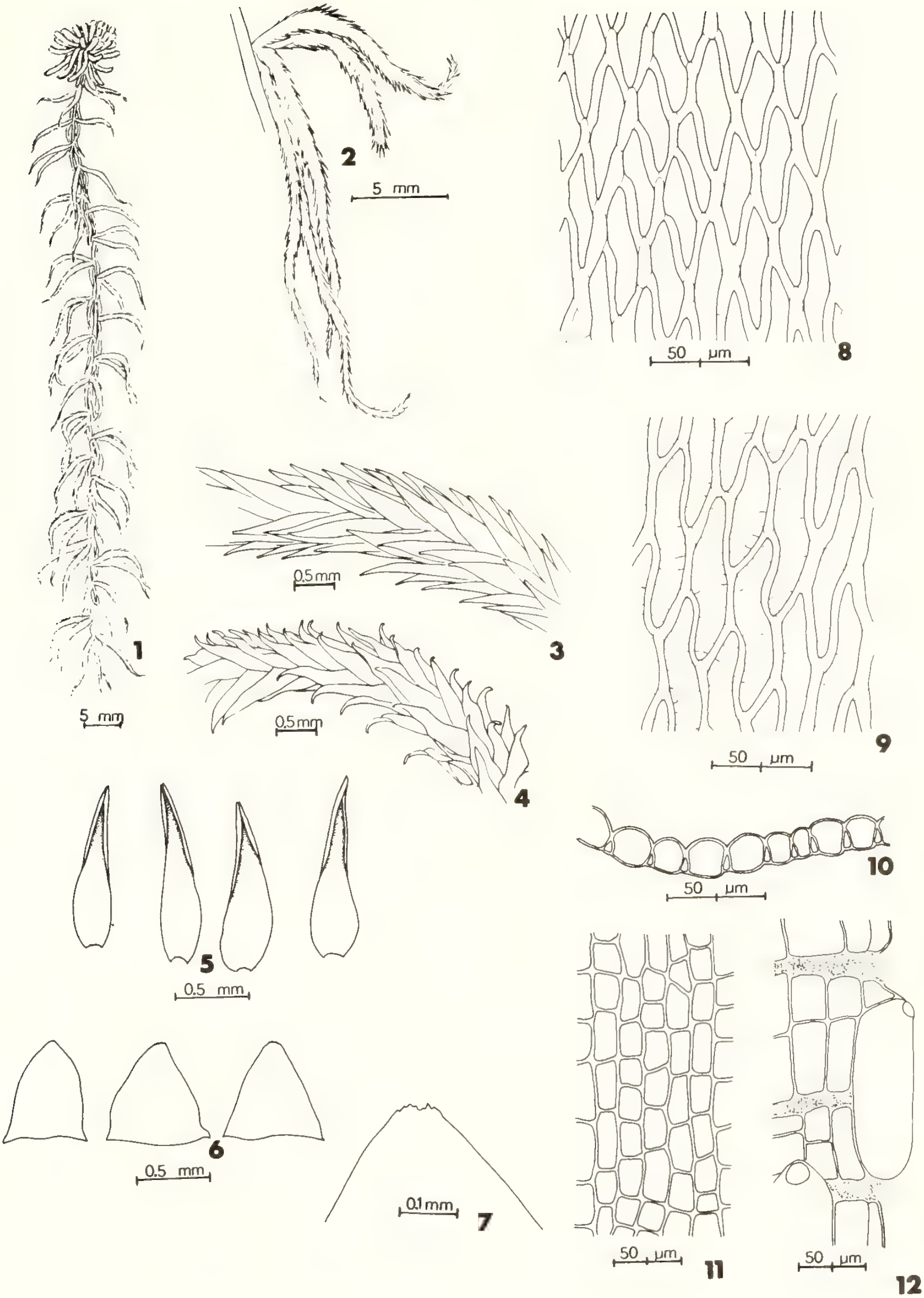
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Plate 24. *Sphagnum angustifolium*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch (wet). 4. Portion of divergent branch (dry). 5. Branch leaves. 6. Stem leaves. 7. Apex of stem leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell.

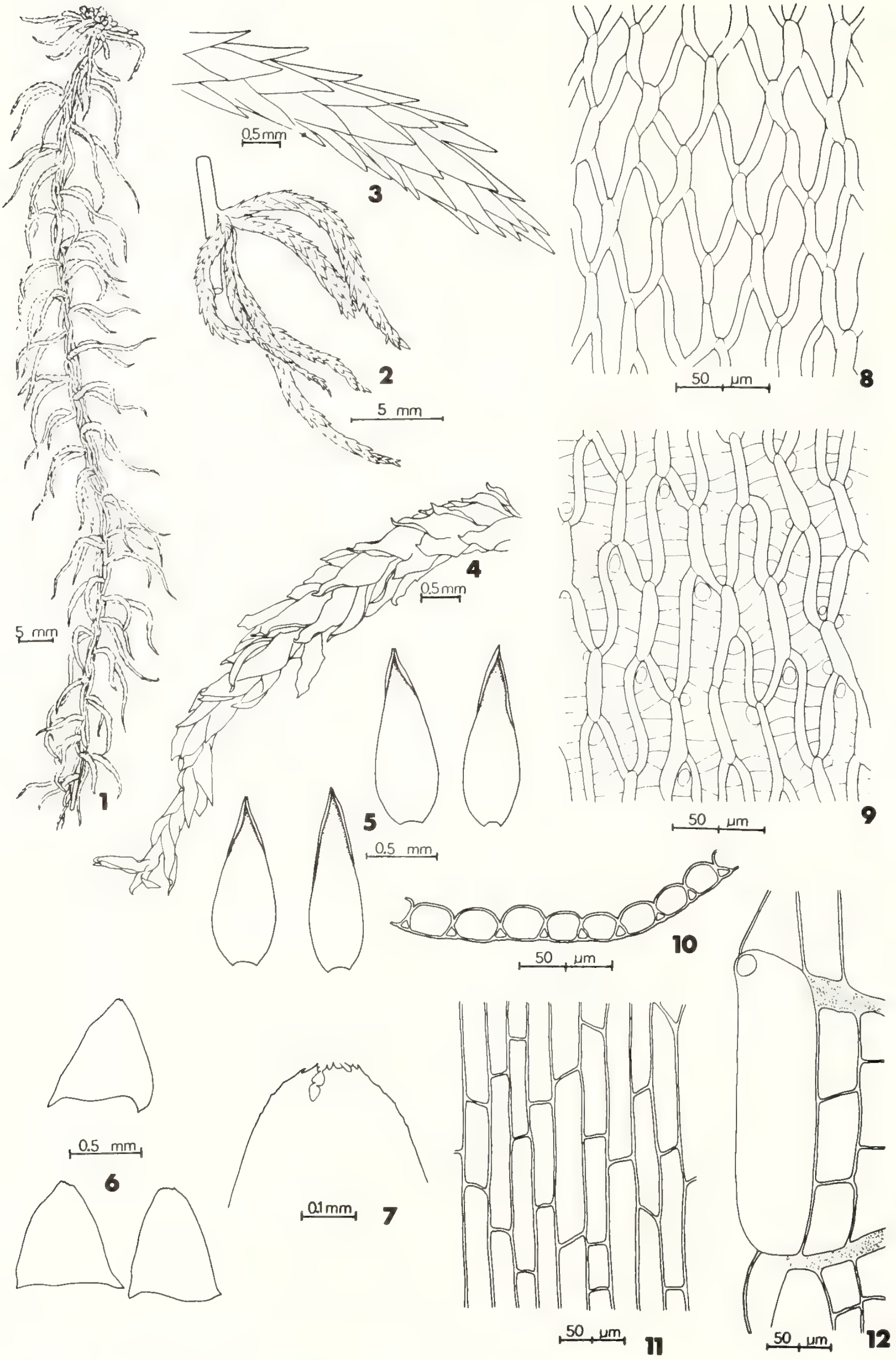
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Plate 25. *Sphagnum flexuosum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch (wet). 4. Portion of divergent branch (dry). 5. Branch leaves. 6. Stem leaves. 7. Apex of stem leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Cortical cells of branch showing retort cell.

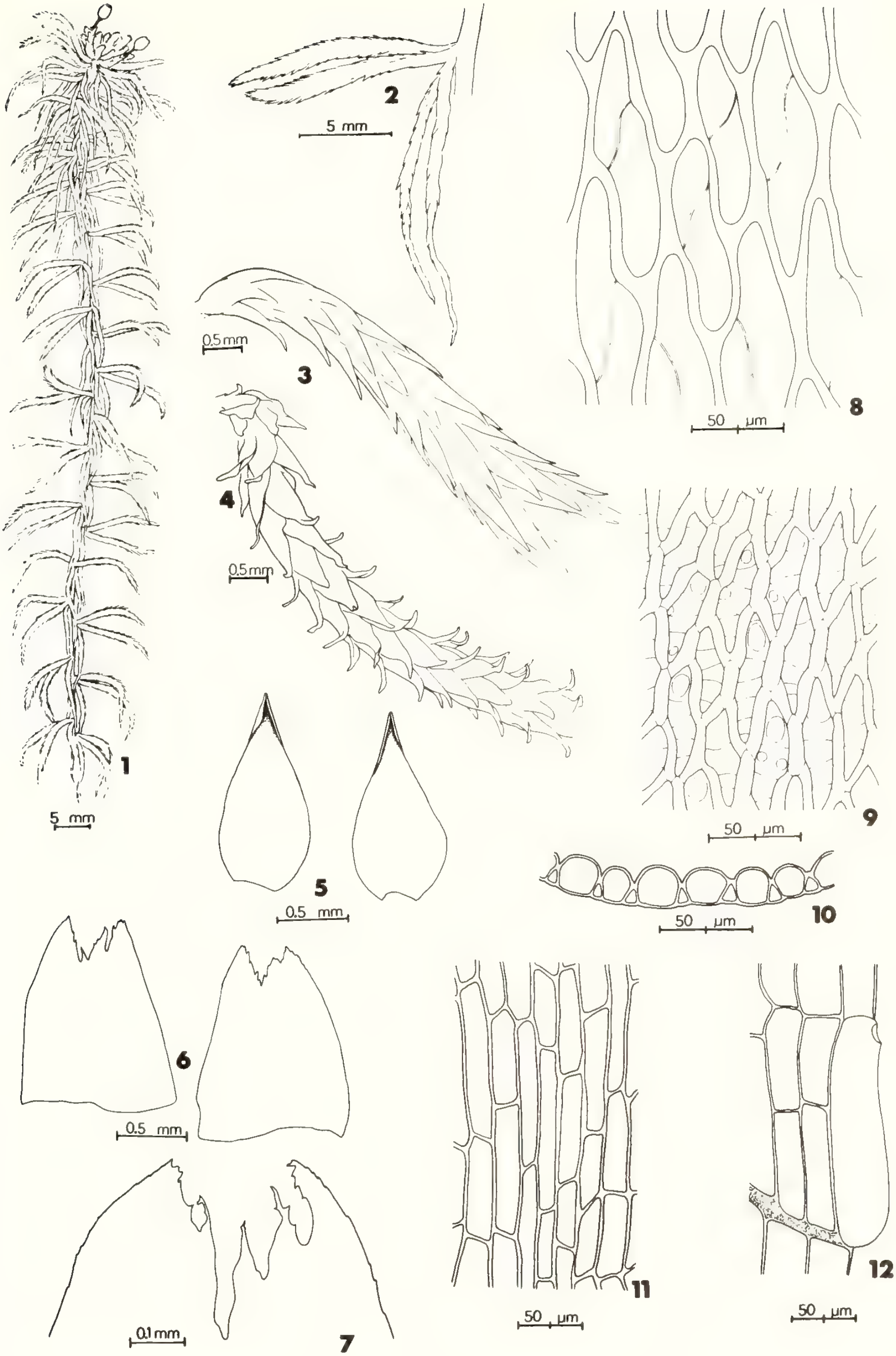
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Plate 26. *Sphagnum riparium*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch (wet). 4. Portion of divergent branch (dry). 5 Branch leaves. 6. Stem leaves. 7. Apex of stem leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell.

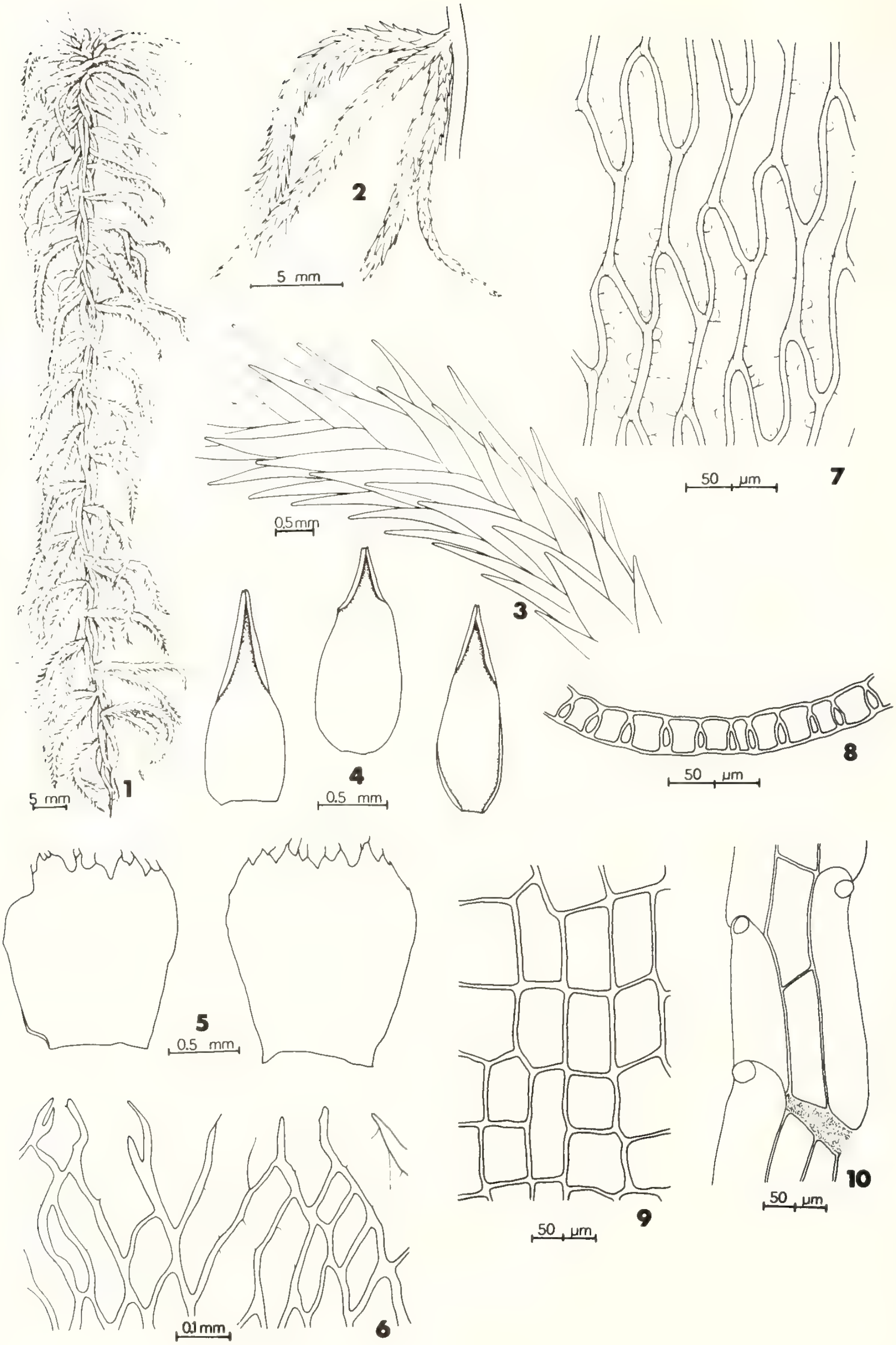
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Plate 27. *Sphagnum lindbergii*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apical cells of stem leaf. 7. Median cells of branch leaf (dorsal surface). 8. Cross-section of median cells of branch leaf. 9. Outer cortical cells of stem. 10. Outer cortical cells of branch showing retort cell.

VI. Section *Subsecunda*

Leaves isophyllous or anisophyllous; hyaline cells on dorsal surface of branch leaves with numerous pores along commissures; chlorophyllose cells of branch leaves truncately elliptic to trapezoidal in cross-section, exposed equally on both surfaces or somewhat broader on dorsal surface.

1. Plants brown to nearly black, sparsely branched, branches short; hyaline cells on dorsal surface of branch leaves lacking pores or with a few end pores . . . . 21. *S. pylaesii*
1. Plants green to yellowish brown or brownish green, usually much branched or if sparsely branched the branches long; hyaline cells on dorsal surface of branch leaves with numerous pores along commissures 2
    2. Stem leaves short, many less than 1 mm; branch leaves often falcate-secund, narrow, less than 1 mm wide; cortical cells of stem with 1 outer layer of enlarged thin-walled cells (seen in cross-section) . . . . 22. *S. subsecundum*
    2. Stem leaves long, 1 mm or more in length; branch leaves straight, broad, often more than 1 mm wide; cortical cells of stem with 2–4 outer layers of enlarged thin-walled cells . . . . 23. *S. platyphyllum*

21. Sphagnum pylaesii Brid., Bryol. Univ. 1: 749. 1827.
[Synonyms: *S. sedoides* Brid.; *S. pylaesii* var. *prostratum* (Brid.) Card.]
PLATE 28

Plants small, slender, sparsely branched, brown to nearly black, leaves isophyllous. Stems with cortex of 1-2 outer layers of enlarged thin-walled cells, leaves ovate or obovate, apex entire. Branches short, in fascicles of 2–3, with 1–2 divergent, sometimes branches single. Branch leaves imbricate, similar to stem leaves but smaller, apex often with a few small teeth, hyaline cells lacking pores or with a few end pores, chlorophyllose cells trapezoidal in cross-section, exposed equally on both surfaces or broader on dorsal surface, walls of hyaline cells smooth.

Habitat: In depression in bogs and fens.

Maritime Distribution: Frequent. New Brunswick (Saint John); Nova Scotia (Annapolis, Halifax, Inverness, Lunenburg, Richmond, Shelburne, Victoria).

Range: Labrador to Quebec, south to North Carolina and Tennessee. *Europe, *South America.

Chromosome Number: n = 19.

22. Sphagnum subsecundum Nees *ex* Sturm, Deutschl. Fl. 2(17): 3. 1819.
PLATE 29

Plants small, slender, much branched, green, yellowish brown or somewhat orange, with a brown stem, leaves anisophyllous. Stems with cortex of one outer layer of enlarged thin-walled cells, leaves lingulate or triangular-lingulate, apex entire or minutely denticulate. Branches long, in fascicles of 2–6, with 2–3 divergent. Branch leaves spreading to slightly falcate-secund and upturned, especially at capitulum, ovate to ovate-lanceolate, involute, apex with a few small teeth, hyaline cells on dorsal surface with numerous pores crowded along commissures, ventral surface with few or no pores, chlorophyllose cells truncately elliptic to trapezoidal in cross-section, usually exposed more broadly on dorsal surface, walls of hyaline cells smooth.

Habitat: In fens and wet sedge meadows, frequently beside lakes.

Maritime Distribution: Frequent. New Brunswick (Queen's, Saint John); Nova Scotia (Annapolis, Halifax, Inverness, Lunenburg, Victoria).

Range: Greenland to Alaska, south to Georgia, Mississippi, Louisiana, Texas, and *California. Mexico, West Indies, Central and South America, Europe, Asia, *Africa, Australia.

Chromosome Number: n = 19 + 2, 19 + 7.

23. Sphagnum platyphyllum (Lindb. *ex* Braithw.) Sull. *ex* Warnst., Flora 67: 481. 1884.
Sphagnum laricinum var. *platyphyllum* Lindb. *ex* Braithw., Not. Saellsk. F. Fl. Fenn. Foerh. 13: 403. 1874.
[Synonym: *S. subsecundum* var. *platyphyllum* (Lindb. *ex* Braithw.) Card.]
PLATE 30

Plants small to medium-sized, with a large terminal bud, sparsely branched, dark green to yellowish brown, leaves isophyllous. Stems with cortex of 2–4 outer layers of enlarged thin-walled cells, leaves broadly ovate to oblong, concave, apex entire. Branches long, stout, in fascicles of 2–3, with 1–2 divergent, sometimes branches single.

Branch leaves imbricate, similar to stem leaves or somewhat smaller, strongly concave, apex sometimes with a few teeth, hyaline cells on dorsal surface with numerous pores along commissures, ventral surface with few or no pores, chlorophyllose cells truncately elliptic to trapezoidal in cross-section, usually exposed more broadly on dorsal surface, walls of hyaline cells smooth.

Habitat: In an open fen.

Maritime Distribution: Rare. New Brunswick (Carleton). Collected once in Northampton Parish, 1 mile north of Kilmarnock Settlement, ca. 46°05′N, 67°29′W, 20 August 1975 (*Comeau 356* CANM).

Range: *Greenland to Ontario, south to New York, Michigan, and *Minnesota; in western North America from *Alaska, British Columbia, Alberta and at high elevations in *Arizona and Wyoming. Europe, *Asia.

Chromosome Number: n = 19.

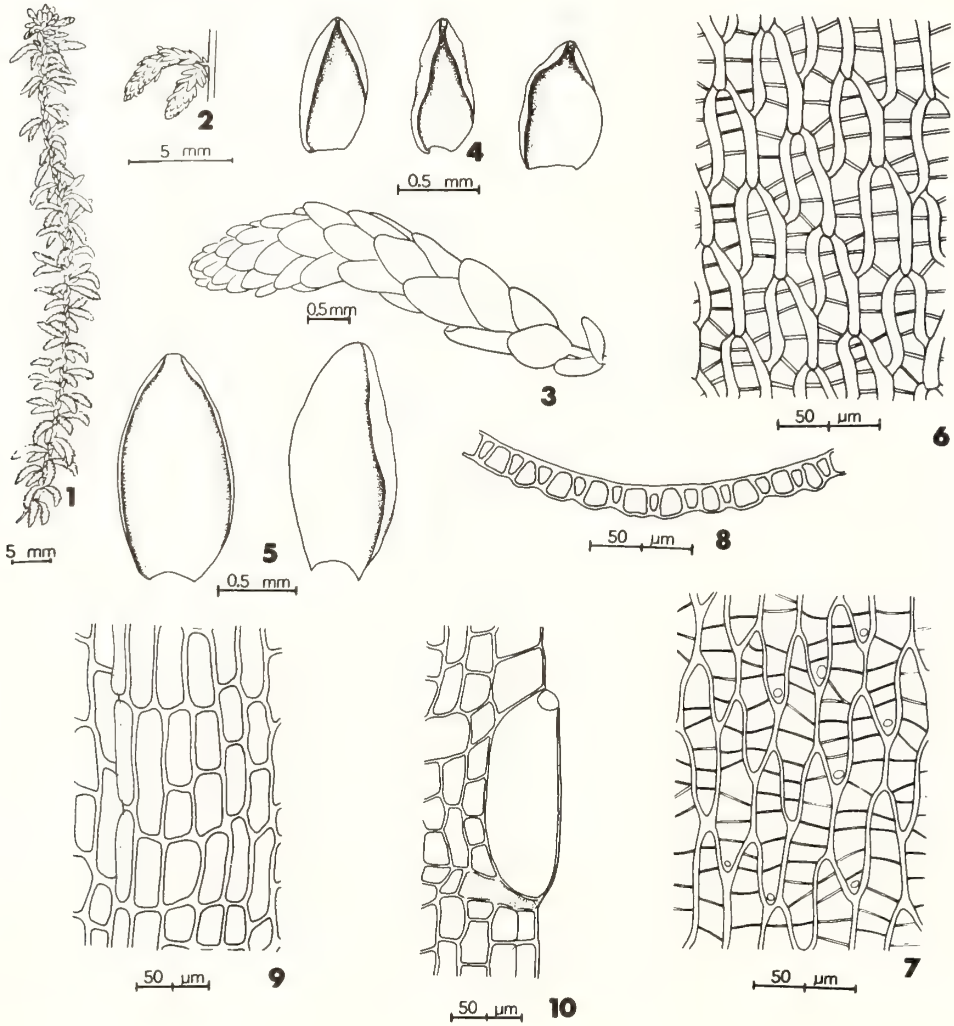

Plate 28. *Sphagnum pylaesii*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Median cells of branch leaf (dorsal surface). 7. Median cells of branch leaf (ventral surface). 8. Cross-section of median cells of branch leaf. 9. Outer cortical cells of stem. 10. Outer cortical cells of branch showing retort cell.

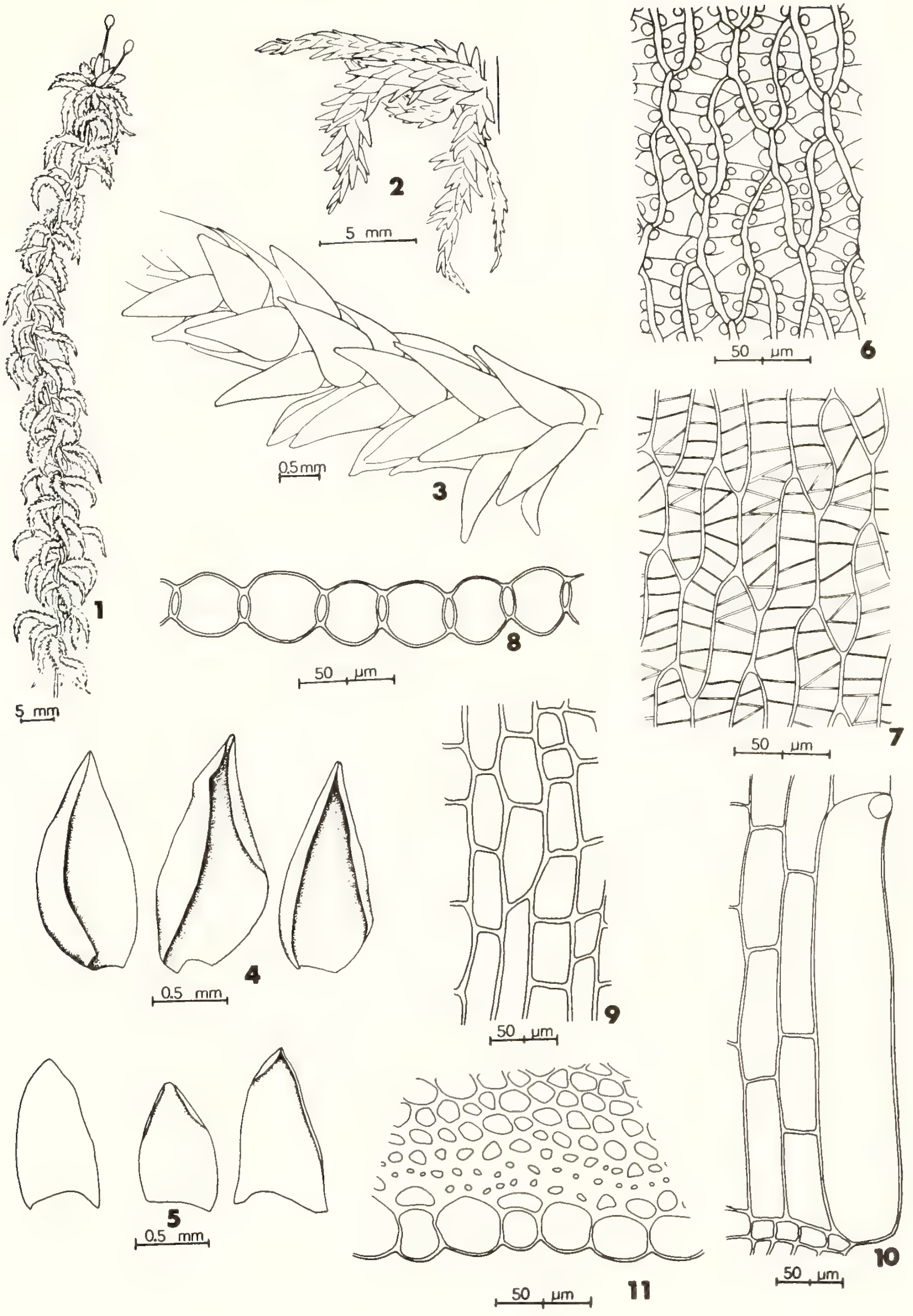
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Plate 29. *Sphagnum subsecundum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Median cells of branch leaf (dorsal surface). 7. Median cells of branch leaf (ventral surface). 8. Cross-section of median cells of branch leaf. 9. Outer cortical cells of stem. 10. Outer cortical cells of branch showing retort cell. 11. Cross-section of portion of stem.

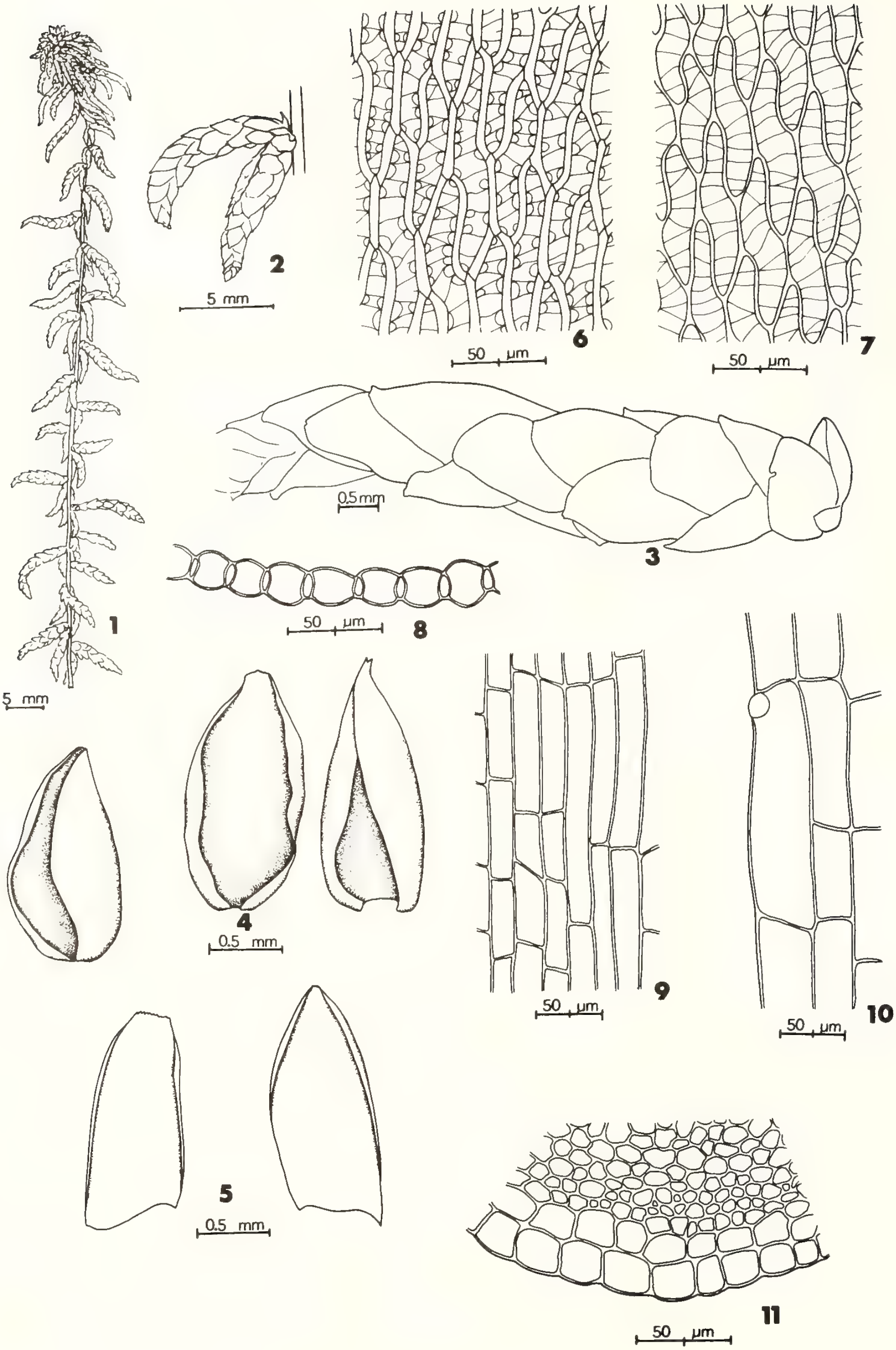
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Plate 30. *Sphagnum platyphyllum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Median cells of branch leaf (dorsal surface). 7. Median cells of branch leaf (ventral surface). 8. Cross-section of median cells of branch leaf. 9. Outer cortical cells of stem. 10. Outer cortical cells of branch showing retort cell. 11. Portion of cross-section of stem.

VII. Section *Polyclada*

Branches 6–13 per fascicle.

One of the most distinct Sections and it contains only one species.

24. Sphagnum wulfianum Girg., Arch. Naturk. Livl. Ehstl. Kurl. ser. 2, 2: 173. 1860.
[Synonym: *S. wulfii* Lindb.]
PLATE 31

Plants medium-sized to large, dark green, tinged with brown and red. Stem leaves small, triangular-lingulate, apex entire or weakly fimbriate. Branches in fascicles of 6–13, with 3–6 divergent. Branch leaves 5-ranked, spreading, recurved at apices when dry, ovate-lanceolate, tubulose above, toothed across apex, chlorophyllose cells elliptic to truncately elliptic in cross-section, central, enclosed on both surfaces by hyaline cells, small ringed pores on dorsal surface of hyaline cells, walls of hyaline cells smooth.

Habitat: Forming mats over damp humus.

Maritime Distribution: Frequent. New Brunswick (Charlotte, Kent, Queen's, Westmorland); Nova Scotia (Hants).

Range: *Greenland to British Columbia, south to *Pennsylvania, *Ohio, Michigan, Wisconsin, Minnesota, Manitoba, Saskatchewan, and Alberta. Europe, *Asia.

Chromosome Number: $n = 19 + 5$.

Remarks: An easily recognized species because of the profusion of branches in each fascicle (6–13) and the large, rounded capitulum that resembles a head of clover as remarked by Crum (1976).

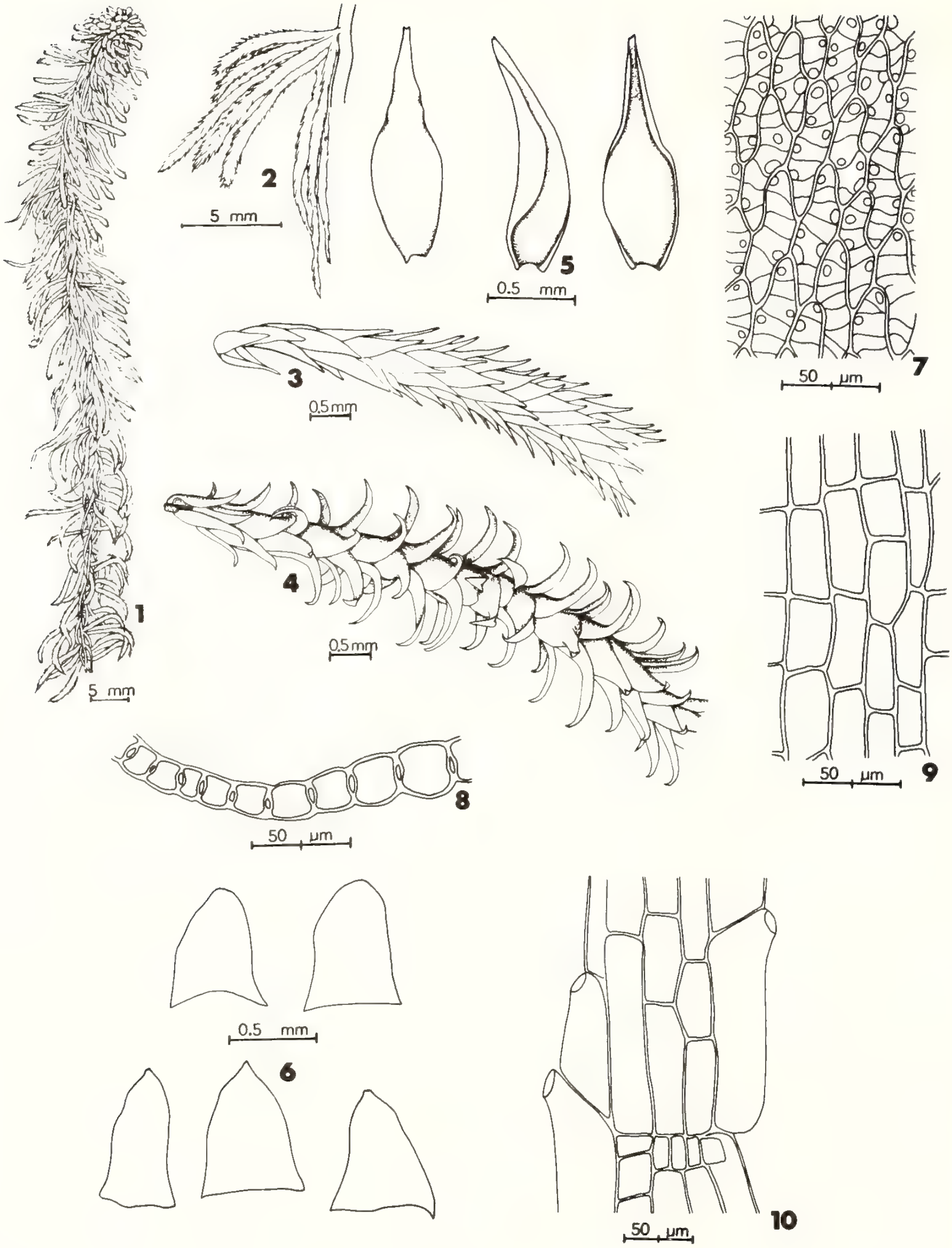
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Plate 31. *Sphagnum wulfianum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch (wet). 4. Portion of divergent branch (dry). 5. Branch leaves. 6. Stem leaves. 7. Median cells of branch leaf (dorsal surface). 8. Cross-section of median cells of branch leaf. 9. Outer cortical cells of stem. 10. Outer cortical cells of branch showing retort cells.

VIII. Section *Acutifolia*

Plants often with some red or purple pigmentation; leaves anisophyllous; stem leaves bordered by linear cells, the border often abruptly widened below; hyaline cells of branch leaves with ringed pores on dorsal surface; chlorophyllose cells of branch leaves in cross-section exposed more broadly on the ventral surface.

1. Stem and branch leaf apices similar, broadly rounded-obtuse or truncate .... 25. *S. angermanicum*

1. Stem and branch leaf apices often different, the branch leaves acute 2

  2. Stem leaves fimbriate or lacerate across all of the broad apex and sometimes down the sides; plants green to yellowish green and never with red colouration 3

    3. Stem leaves fimbriate or lacerate only at apex .... 35. *S. girgensohnii*

    3. Stem leaves lacerate at apex and down the sides .... 36. *S. fimbriatum*

  2. Stem leaves entire, toothed, fimbriate or erose across only a portion of apex; plants often with at least some red or brown colouration 4

    4. Stems dark brown 5

      5. Plants brown to reddish brown, slender, compact, branches usually less than 1 mm wide; stem leaves lingulate .... 28. *S. fuscum*

      5. Plants brown, often with a metallic purplish lustre when dry, robust, loose, branches mostly 1 mm or more wide; stem leaves lingulate-triangular .... 26. *S. flavicomans*

    4. Stems green, yellow or red, but not dark brown 6

      6. Stem leaves lingulate, apices mostly broad and obtuse 7

        7. Stem leaves slightly erose at middle of apex; hyaline cells in upper part of stem leaves efibrillose, or rarely with a few fibrils .... 34. *S. russowii*

        7. Stem leaves entire or with a few small teeth at apex, but not erose; hyaline cells in upper part of stem leaves strongly fibrillose, rarely efibrillose 8

          8. Plants usually purplish-red, branch leaves distinctly 5-ranked, spreading at apex, strongly so when dry; branch leaf hyaline cells with very small, round pores on dorsal surface in upper half of leaf .... 27. *S. warnstorfii*

          8. Plants usually reddish, branch leaves not or indistinctly 5-ranked, imbricate to slightly spreading; branch leaf hyaline cells with larger, round to elliptic pores on dorsal surface in upper half of leaf 9

            9. Branches in fascicles of 4–5, leaves indistinctly 5-ranked, sometimes weakly curved and subsecund; stem leaf hyaline cells often twice-divided in upper half of leaf, fibrillose; common .... 30. *S. rubellum*

            9. Branches in fascicles of 3, leaves neither 5-ranked nor falcate-secund; stem leaf hyaline cells once-divided in upper half of leaf, efibrillose; rare .... 31. *S. andersonianum* (in part)

      6. Stem leaves triangular or triangular-lingulate, rarely lingulate, apices narrow and acute to apiculate, rarely obtuse, sometimes narrowly truncate .. 10

        10. Branches in fascicles of 3 .... 3. *S. andersonianum* (in part)

        10. Branches in fascicles of 4–5 11

          11. Stem leaves triangular, often apiculate; 3 divergent branches per fascicle; branch leaves indistinctly 5-ranked .... 33. *S. quinquefarium*

          11. Stem leaves triangular-lingulate or rarely lingulate; 2 divergent branches per fascicle; branch leaves not 5-ranked 12

12. Stem leaf hyaline cells fibrillose in upper half of leaf .... 29. *S. nemoreum*

12. Stem leaf hyaline cells efibrillose or indistinctly fibrillose in upper half of leaf .... 32. *S. subtile*

25. Sphagnum angermanicum Melin, Svensk. Bot. Tidskr. 13: 21. 1919.

PLATE 32

Plants soft and weak, medium-sized, whitish green to yellowish green, often with a slight purplish colouration and a metallic lustre when dry. Outer cortical cells of stem occasionally porose. Stem leaves lingulate-triangular, apex rounded-obtuse, toothed, hyaline cells at apex usually once divided, fibrillose. Branches in fascicles of 2–4, with 2 divergent. Branch leaves imbricate, ovate, apex broad, truncate, toothed, hyaline cells on dorsal surface with elliptic pores along commissures.

Habitat: In open fens and bogs, or sometimes in wet depressions in boggy forests.

Maritime Distribution: Common. New Brunswick (Charlotte, Queen's, Saint John); Nova Scotia (Annapolis, Guysborough, Halifax, Hants, Inverness, Lunenburg, Richmond, Shelburne, Victoria, Yarmouth).

Range: A suboceanic species of eastern North America, occurring from *Labrador to Quebec, south to New Jersey and New York. Europe.

Chromosome Number: n = 19.

Remarks: Maass (1967) studied the taxonomy and distribution of this species in North America.

26. Sphagnum flavicomans (Card.) Warnst., Sphagn. Univ. 79. 1911.

Sphagnum acutifolium var. *flavicomans* Card., Rev. Bryol. 11: 55. 1884.

[Synonym: *S. plumulosum* var. *flavicomans* (Card.) Andr.]

PLATE 33

Plants medium-sized to large, robust, brown, often with a metallic purplish lustre when dry. Outer cortical cells of stem aporose. Stem leaves lingulate-triangular, apex toothed, hyaline cells at apex once divided, usually fibrillose. Branches in fascicles of 3–5, with 2 divergent. Branch leaves imbricate, ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with elliptic pores along commissures.

Habitat: Forming hummocks, frequently in the more shaded parts of bogs.

Maritime Distribution: Frequent. New Brunswick (Charlotte); Nova Scotia (Colchester, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Shelburne); Prince Edward Island (Kings).

Range: An oceanic species, endemic to eastern North America, occurring from Labrador to *Quebec, south to New Jersey and New York.

Chromosome Number: n = 19.

27. Sphagnum warnstorfii Russ., Sitzungsber. Naturf. Ges. Dorpat 8: 315. 1888.

[Synonym: *S. warnstorfianum* DuRietz]

PLATE 34

Plants small to medium-sized, green or often purplish-red. Outer cortical cells of stem aporose. Stem leaves triangular- to oblong-lingulate, apex obtuse to acute, entire or weakly denticulate, hyaline cells at apex once divided, efibrillose. Branches in fascicles of 3–5, with 2 divergent. Branch leaves 5-ranked, spreading, ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with very small, round, strongly ringed pores along commissures in upper half of leaf, becoming elliptic toward base.

Habitat: A calcareous species, occurring in eutrophic bogs, fens and *Thuja* swamps.

Maritime Distribution: Frequent. New Brunswick (Carleton, Kent, York); Nova Scotia (Colchester, Inverness, Victoria).

Range: Greenland to Alaska, south to Florida, Michigan, *Wisconsin, Minnesota, Colorado, Montana, *Idaho, and *Oregon. South America, Europe, *Asia.

Chromosome Number: n = 19+2−4, 19+4, 38+2.

Remarks: The generally purplish-red plants with spreading, 5-ranked leaves aid in the recognition of this calcareous species.

28. Sphagnum fuscum (Schimp.) Klinggr., Schrift. Phys. Oek. Ges. Köningsberg 13(1): 4. 1872.

Sphagnum acutifolium var. *fuscum* Schimp., Mém. Hist. Nat. Sphaign. 64. 1857.

PLATE 35

Plants small to medium-sized, slender, in compact tufts, brown, greenish- or reddish-brown. Outer cortical cells of stem aporose. Stem leaves lingulate, apex broadly rounded, entire to erose, hyaline cells at apex 1–2 divided, efibrillose. Branches in fascicles of 3–5, with 2 divergent.

Branch leaves imbricate to slightly spreading at apices, ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with round to elliptic pores along commissures.

Habitat: In hummocks in open bogs.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, Saint John, Victoria, Westmorland); Nova Scotia (Annapolis, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to Virginia, Michigan, Wisconsin, Minnesota, Colorado, *Utah, *Idaho, and *Oregon. Europe, Asia.

Chromosome Number: n = 19, 19 + 3 – 4, 19 + 4.

Remarks: A species that grows in compact tufts, usually at the top of hummocks, and is distinctive because of its relatively small, slender plants with a brownish colouration (especially below). Other *Acutifolia* species whose leaves have some brown colouration do not have brown stems typical of *S. fuscum*, except for *S. flavicomans* which is a much larger plant.

29. Sphagnum nemoreum Scop., Fl. Carn. ed. 2: 305. 1772.

[Synonyms: *S. capillaceum* (Weiss) Schrank; *S. capillifolium* (Ehrh.) Hedw.; *S. acutifolium* Schrad.]

PLATE 36

Plants small to medium-sized, green or often variegated red or pink and green. Outer cortical cells of stem aporose or rarely porose. Stem leaves triangular-lingulate, apex acute or narrowly truncate, somewhat involute, weakly toothed, hyaline cells at apex once divided, fibrillose. Branches in fascicles of 3–5, with 2 divergent. Branch leaves imbricate to slightly spreading, ovate to ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with elliptic pores along commissures.

Habitat: Usually in hummocks in bogs and fens, but also frequent in wet depressions, on humus and wet rocks in woods.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, Northumberland, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Inverness, Kings, Lunenburg, Richmond, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to North Carolina, Michigan, *Indiana, Wisconsin, Minnesota, *Arkansas, *Kansas, Colorado, *Montana, and Washington. *Mexico, Europe, *Asia, *Africa.

Chromosome Number: n = 19 + 2, 19 + 4, 19 + 4 – 9.

Remarks: One of the most common and taxonomically difficult species in the Maritimes. Besides being confused with *S. quinquefarium* and *S. subtile*, with which it should be closely compared, it can also be difficult to distinguish from forms of *S. rubellum* and *S. russowii*. It differs from *S. rubellum* in its stem leaves that are acute or narrowly truncate, instead of obtuse to broadly rounded, and its branch leaves that are straight or nearly so, instead of sometimes being subsecund. See remarks under *S. russowii* for distinction from that species.

30. Sphagnum rubellum Wils., Bryol. Brit. 19. 1855.

[Synonyms: *S. capillaceum* var. *tenellum* (Schimp.) Andr.; *S. capillifolium* var. *tenellum* (Schimp.) Crum]

PLATE 37

Plants small to medium-sized, red or variegated red and yellowish green. Outer cortical cells of stem aporose. Stem leaves lingulate, apex obtuse to broadly rounded, denticulate to weakly toothed, hyaline cells at apex 1-2 divided, fibrillose. Branches in fascicles of 4–5, with 2 divergent. Branch leaves indistinctly 5-ranked, imbricate, sometimes weakly curved and subsecund, ovate to ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with round to elliptic pores along commissures, elliptic pores at base.

Habitat: In depressions and in hummocks in open bogs, sometimes in fens and boggy parts of woods.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, Saint John, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to *South Carolina, Michigan, *Wisconsin, Minnesota, Colorado, and *Washington. Europe, Asia, *Africa.

Chromosome Number: n = 19, 19 + 2, 19 + 4.

Remarks: A species that should be compared closely with *S. nemoreum*, *S. andersonianum* and *S. russowii*.

31. Sphagnum andersonianum Andrus, Bryologist 83(1): 60. 1980.
PLATE 38

Plants small, pink to light purplish red. Outer cortical cells of stem aporose or porose. Stem leaves lingulate, apex obtuse to slightly apiculate, entire to denticulate, hyaline cells at apex once divided, fibrillose or efibrillose. Branches in fascicles of 3, with 2 divergent. Branch leaves imbricate to somewhat spreading, ovate to ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with round to elliptic pores along commissures.

Habitat: Hummocks in bog.

Maritime Distribution: Rare. Nova Scotia (Inverness). Known from one collection by *W.B. Schofield 5993* (det. R.E. Andrus), collected 1 September 1955 near French Mountain.

Range: Endemic to eastern North America where it is known from *New York, *Labrador, and Nova Scotia.

Chromosome Number: Unreported.

Remarks: A rare and apparently an endemic North American species closely related to *S. rubellum* from which it differs by having only one hanging branch per fascicle and by a few other minor characters. Crum and Anderson (1981) consider *S. andersonianum* of doubtful value.

32. Spagnum subtile (Russ.) Warnst., Krypt. Fl. Brandenburg 1: 409. 1903.
Sphagnum acutifolium var. *subtile* Russ., Arch. Naturk. Livl. Ehstl. Kurl. ser. 2, 10: 509. 1894.
[Synonym: *S. nemoreum* var. *subtile* (Russ.) Nyh.]
PLATE 39

Plants small to medium-sized, green, sometimes reddish tinged. Outer cortical cells of stem aporose. Stem leaves triangular-lingulate to lingulate, apex acute to narrowly obtuse, entire, hyaline cells at apex once divided, indistinctly fibrillose or efibrillose. Branches in fascicles of 3–5, with 2 divergent. Branch leaves imbricate, ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with round to elliptic pores along commissures.

Habitat: On wet humus in coniferous woodlands and at margins of lakes.

Maritime Distribution: Rare or seldom collected. New Brunswick (Albert); Nova Scotia (Kings, Victoria); Prince Edward Island (Queens).

Range: Poorly known but occurring from Nova Scotia to Ontario, south to North Carolina, Michigan, Wisconsin, and Minnesota.

Chromosome Number: Unreported.

Remarks: A difficult species that is easy to confuse with *S. nemoreum*. Andrus (1980a) recently studied *S. subtile* and allied species in North America.

33. Sphagnum quinquefarium (Lindb. *ex* Braithw.) Warnst., Hedwigia 25: 222. 1886.
Sphagnum acutifolium var. *quinquefarium* Lindb. *ex* Braithw., Sphagn. Eur. N. Amer. 71. 1880.
PLATE 40

Plants medium-sized, green or sometimes tinged pink or purplish red. Outer cortical cells of stem aporose or porose. Stem leaves triangular, apex apiculate, rarely obtuse, entire to denticulate, hyaline cells at apex once divided, efibrillose. Branches in fascicles of 4–5, with 3 divergent. Branch leaves indistinctly 5-ranked, imbricate to slightly spreading, ovate to ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with round to elliptic pores along commissures.

Habitat: In eutrophic bogs and on humus in coniferous forests, on the ground or over wet bluffs and cliffs.

Maritime Distribution: Frequent. New Brunswick (Charlotte, St. John, Victoria); Nova Scotia (Cape Breton, Halifax, Inverness, Kings, Victoria).

Range: *Labrador and Newfoundland to Ontario, south to North Carolina, Tennessee, and *Michigan. Europe, Asia.

Chromosome Number: $n = 19+2$.

Remarks: Distinctive because of the three divergent branches in each fascicle. The other *Acutifolia* have two divergent branches.

34. Sphagnum russowii Warnst., Hedwigia 25: 225. 1886.
[Synonym: *S. robustum* (Warnst.) Card.]
PLATE 41

Plants medium-sized to large, green, often reddish tinged. Outer cortical cells of stem usually porose. Stem leaves lingulate, apex slightly erose at the middle, hyaline cells at apex sometimes once divided, usually efibrillose. Branches in fascicles of 3–5, with 2 divergent. Branch leaves imbricate, spreading at apices, ovate-lanceolate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with round to elliptic pores along commissures.

Habitat: In hummocks in bogs or sometimes in fens, occasionally on humus in woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Madawaska, Restigouche, Westmorland); Nova Scotia (Annapolis, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to *North Carolina, *Kentucky, *Missouri, *Iowa, Colorado, *Utah, Montana, *Idaho, and Washington. Europe, Asia.

Chromosome Number: n = 19 + 5 – 11, ca. 38, 38 + 8.

Remarks: Sometimes resembling *S. girgensohnii* but the plants often tend to have some red colouration whereas *S. girgensohnii* is always green.

The efibrillose hyaline cells at the apices of the stem leaves of *S. russowii* will prevent confusion of the species with plants of *S. rubellum* and *S. nemoreum* which have fibrillose cells.

35. Sphagnum girgensohnii Russ., Arch. Naturk. Livl. Ehstl. ser. 2,7: 46. 1865.
PLATE 42

Plants medium-sized to large, green to yellowish- or brownish-green. Outer cortical cells of stem porose. Stem leaves lingulate to lingulate-spatulate, apex truncate, fimbriate or lacerate, hyaline cells at apex not or rarely divided, efibrillose. Branches in fascicles of 3–5, with 2 divergent. Branch leaves imbricate, somewhat spreading at apices, especially when dry, ovate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with elliptic pores along commissures.

Habitat: In boggy woods, *Thuja* swamps, wet depressions in forests, and at margins of rivulets and lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, King's, Madawaska, Northumberland, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to North Carolina, Tennessee, *Ohio, *Indiana, *Illinois, Wisconsin, Minnesota, *Montana, *Idaho, and *Oregon. Europe, Asia.

Chromosome Number: n = 19 + 2, 19 + 4.

Remarks: The branches of the capitulum appear to be in five ranks, with the rows particularly apparent when viewed from above.

Sometimes confused with *S. russowii* and see remarks under that species.

36. Sphagnum fimbriatum Wils. *ex* Wils. & Hook. *f.*, Crypt. Bot. Antarct. Voyage 92. 1846.
PLATE 43

Plants medium-sized to large, delicate, green to yellowish- or brownish-green. Outer cortical cells of stem porose. Stem leaves spatulate, apex lacerate, hyaline cells at apex 1–2 divided, efibrillose. Branches in fascicles of 3–5, with 2 divergent. Branch leaves imbricate, somewhat spreading at apices, ovate, apex narrow, involute, truncate, toothed, hyaline cells on dorsal surface with elliptic pores along commissures.

Habitat: In open fens and at margins of bogs, often in moderately dry situations.

Maritime Distribution: Frequent. New Brunswick (Charlotte); Nova Scotia (Annapolis, Guysborough, Halifax, Inverness, Victoria, Sable Island); Prince Edward Island (Prince, Queens).

Range: Greenland to Alaska, south to *Maryland, *Ohio, *Indiana, *Wisconsin, *Missouri, *Wyoming, Idaho, and *California. South America, Europe, Asia, *Africa, *New Zealand.

Chromosome Number: n = 19, 19 + 4, 19 + 6 – 7, 38 + 4.

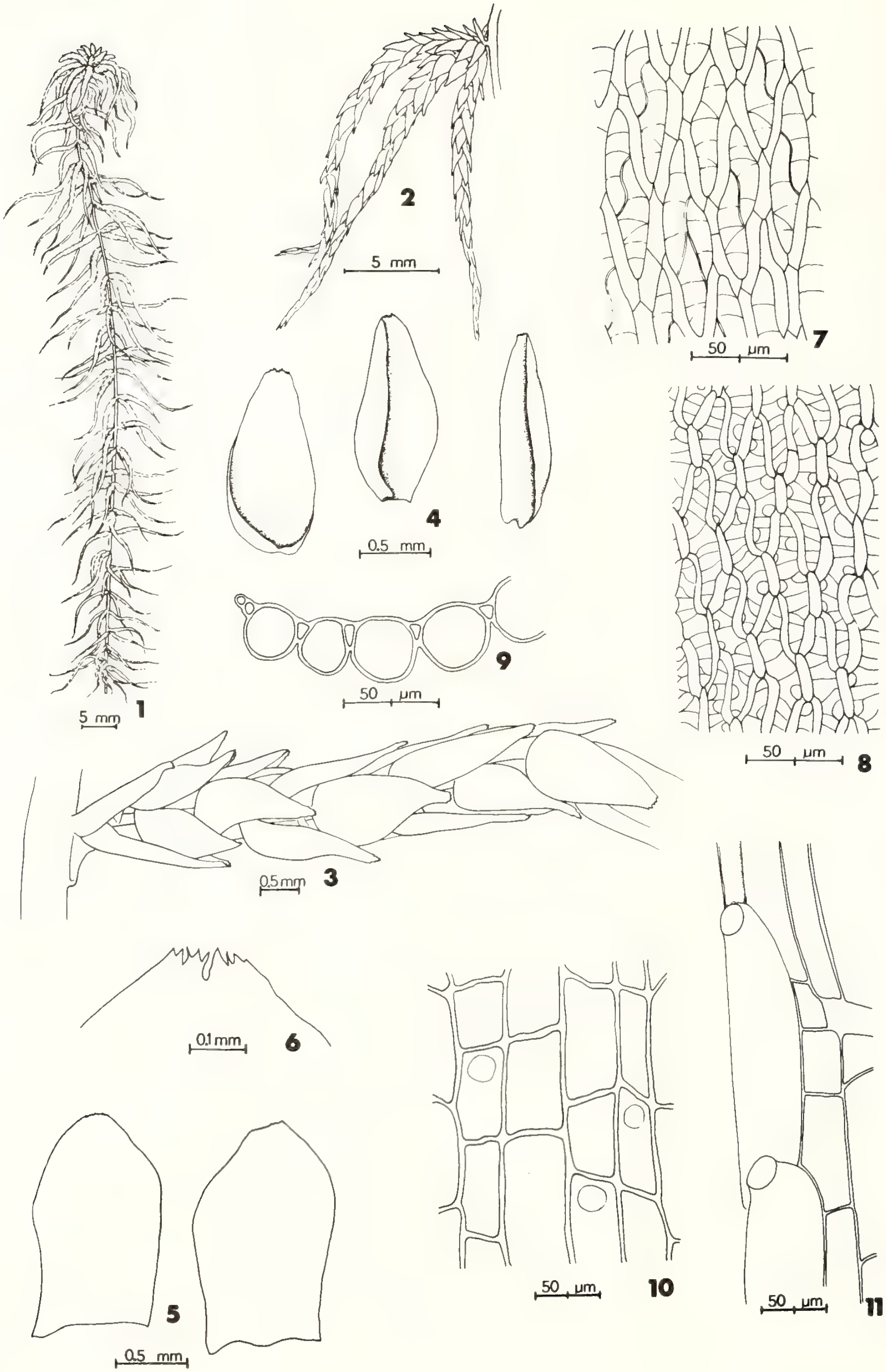
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Plate 32. *Sphagnum angermanicum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

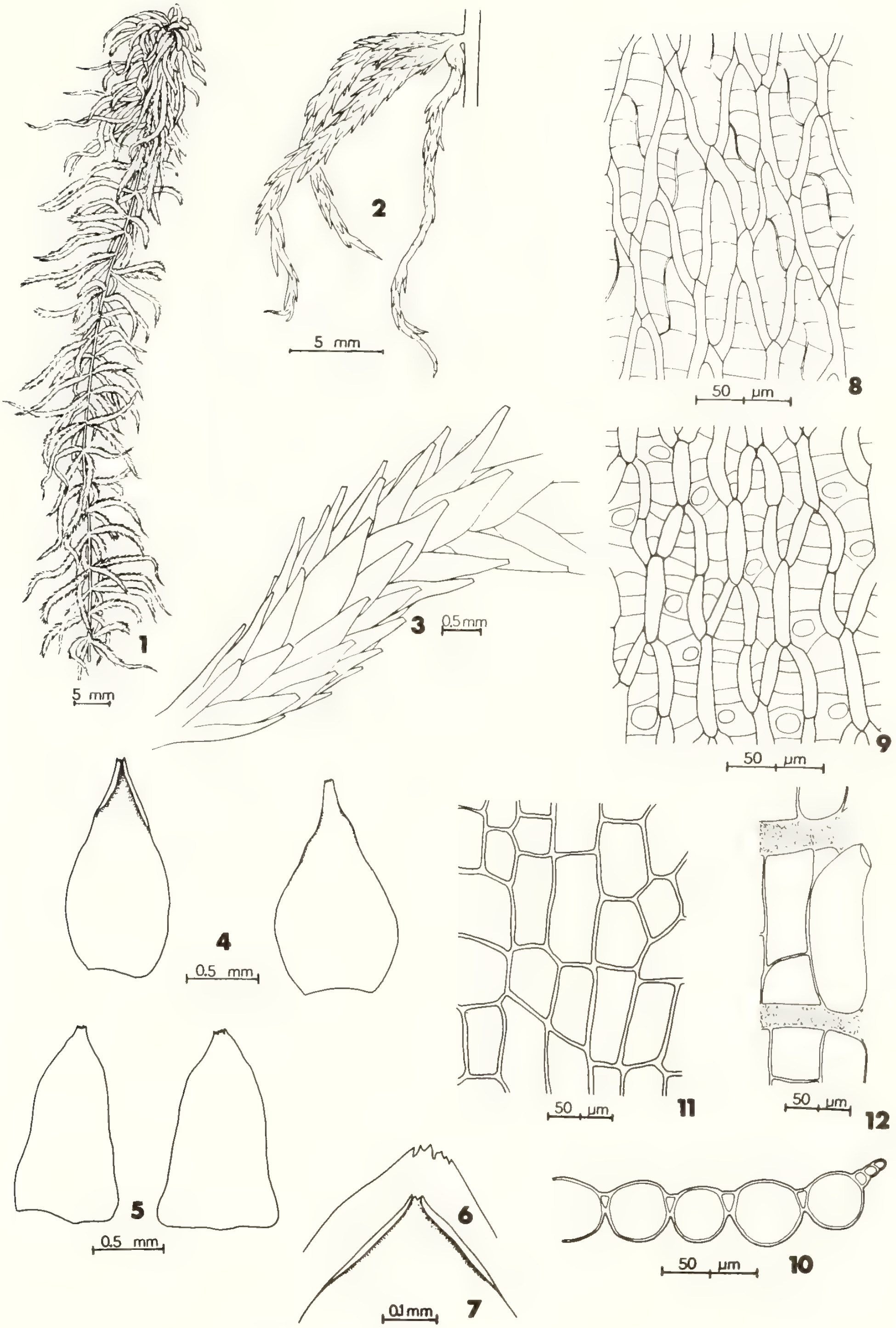
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Plate 33. *Sphagnum flavicomans*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6–7. Apices of stem leaves. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (ventral surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell.

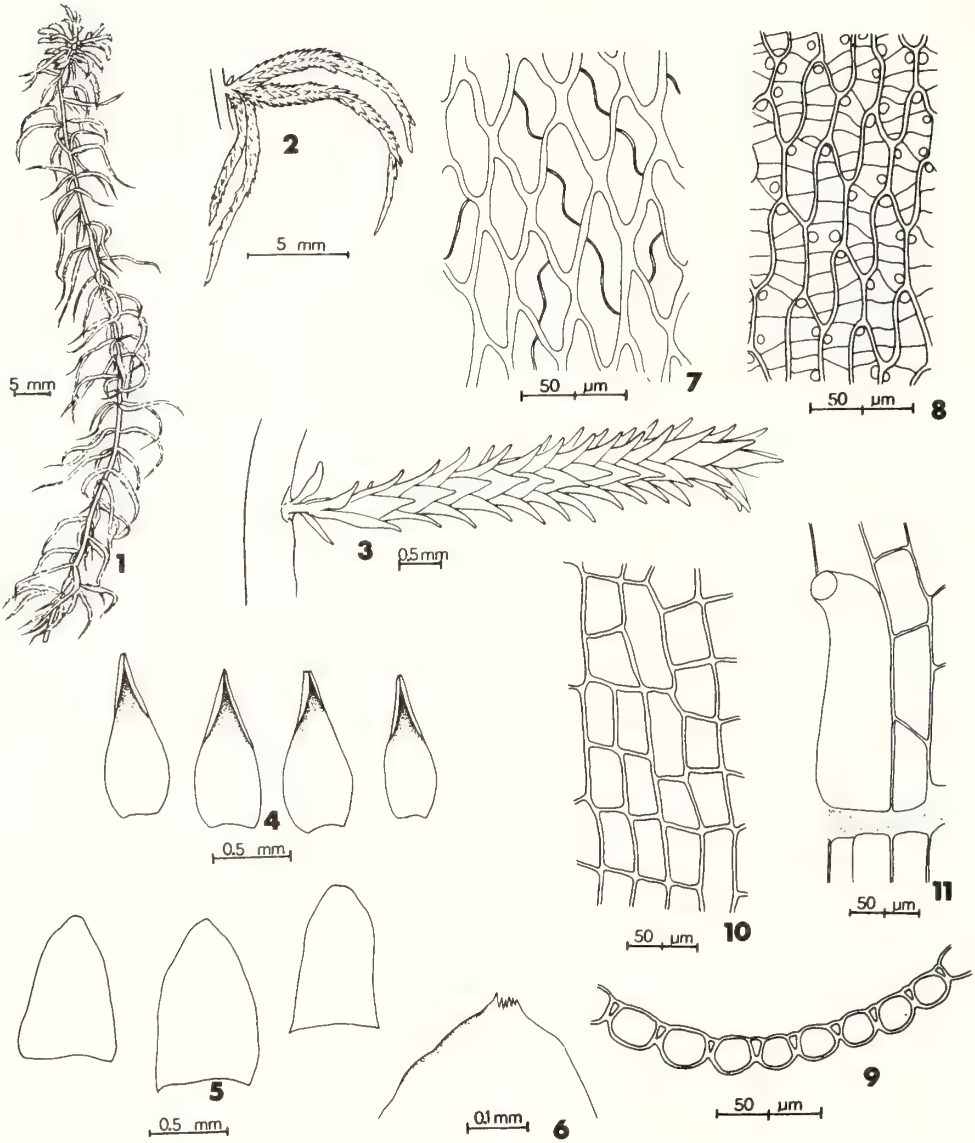
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Plate 34. *Sphagnum warnstorfii*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

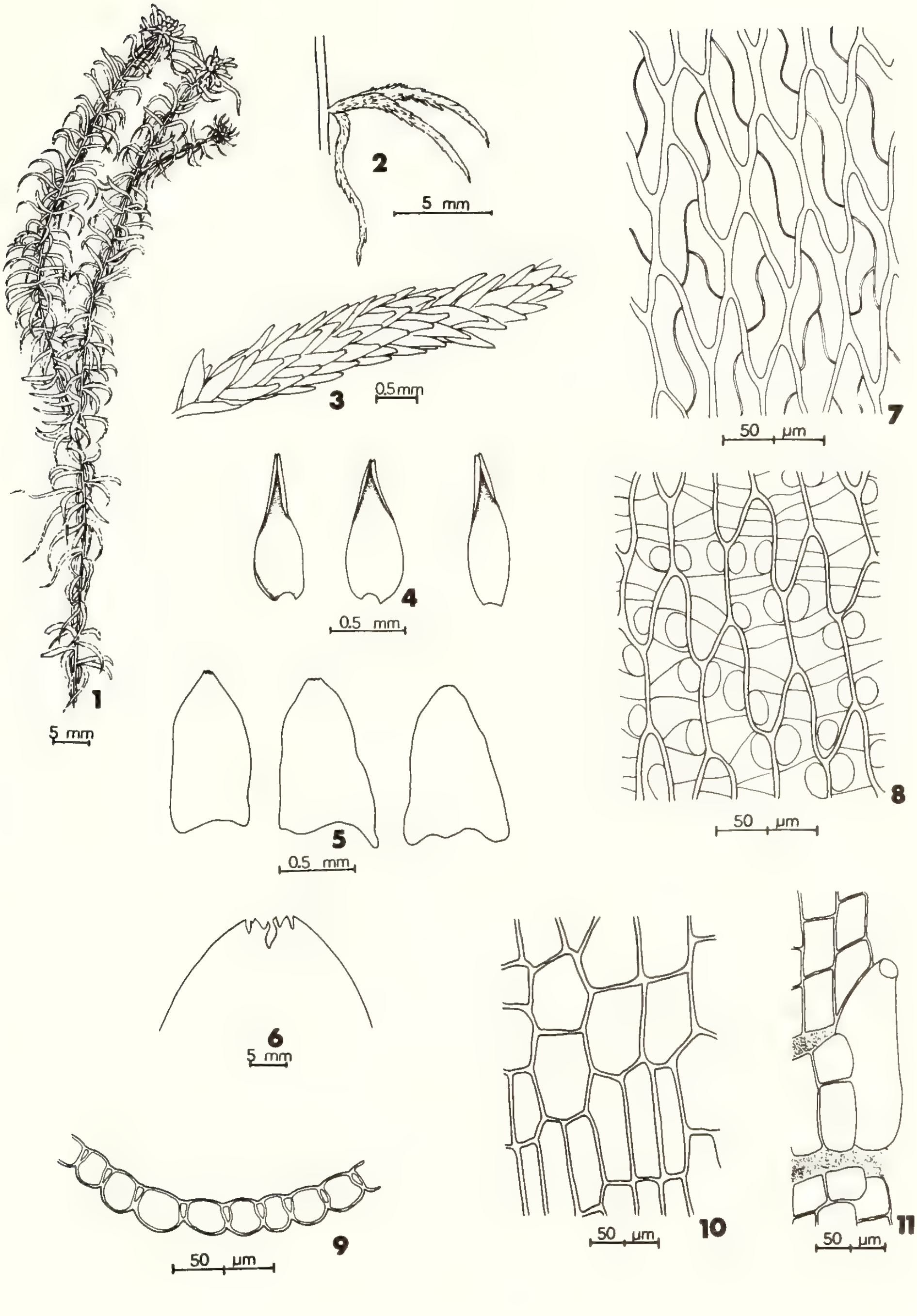
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Plate 35. *Sphagnum fuscum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

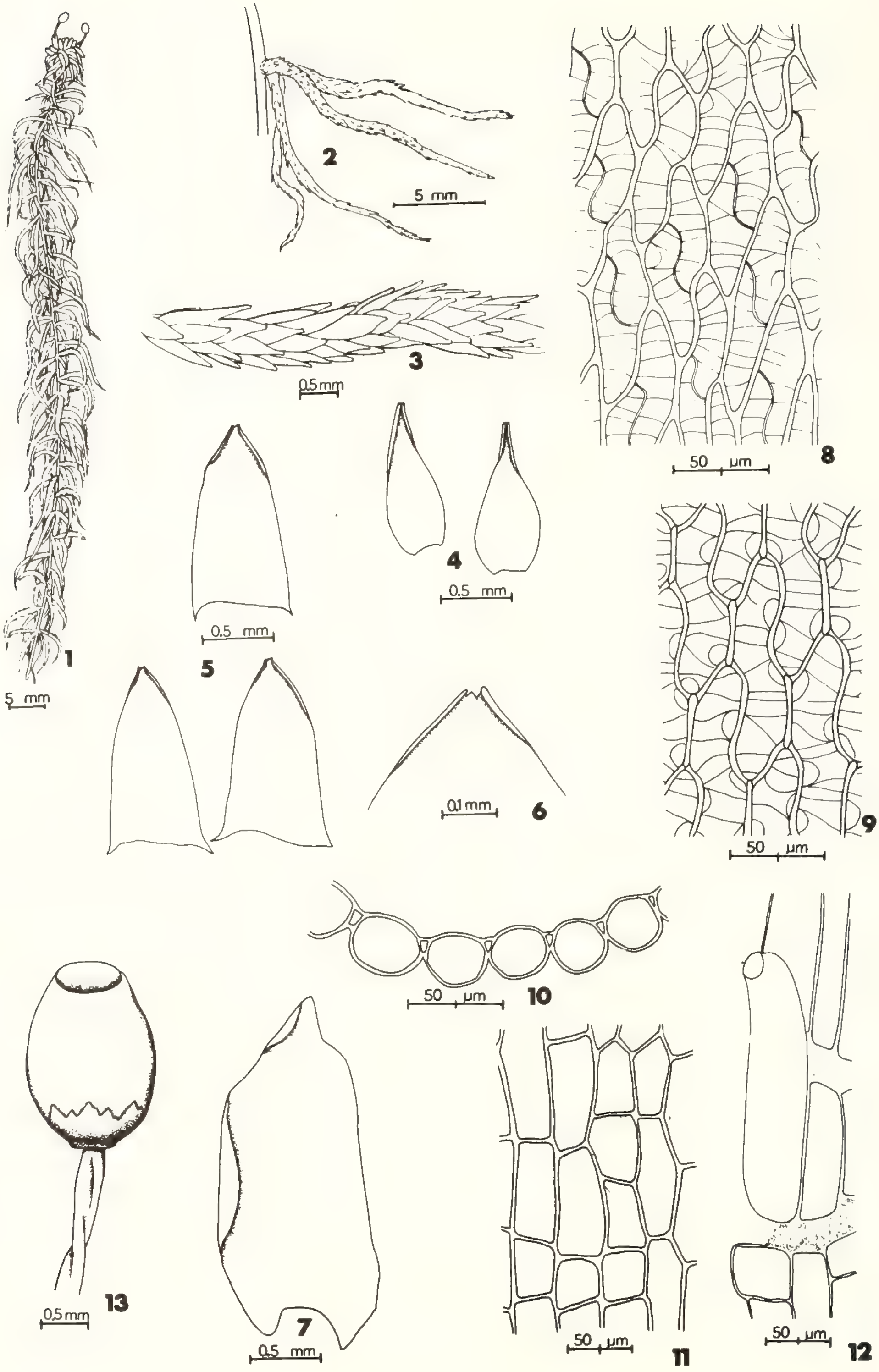
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Plate 36. *Sphagnum nemoreum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Perichaetial leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell. 13. Capsule (dry).

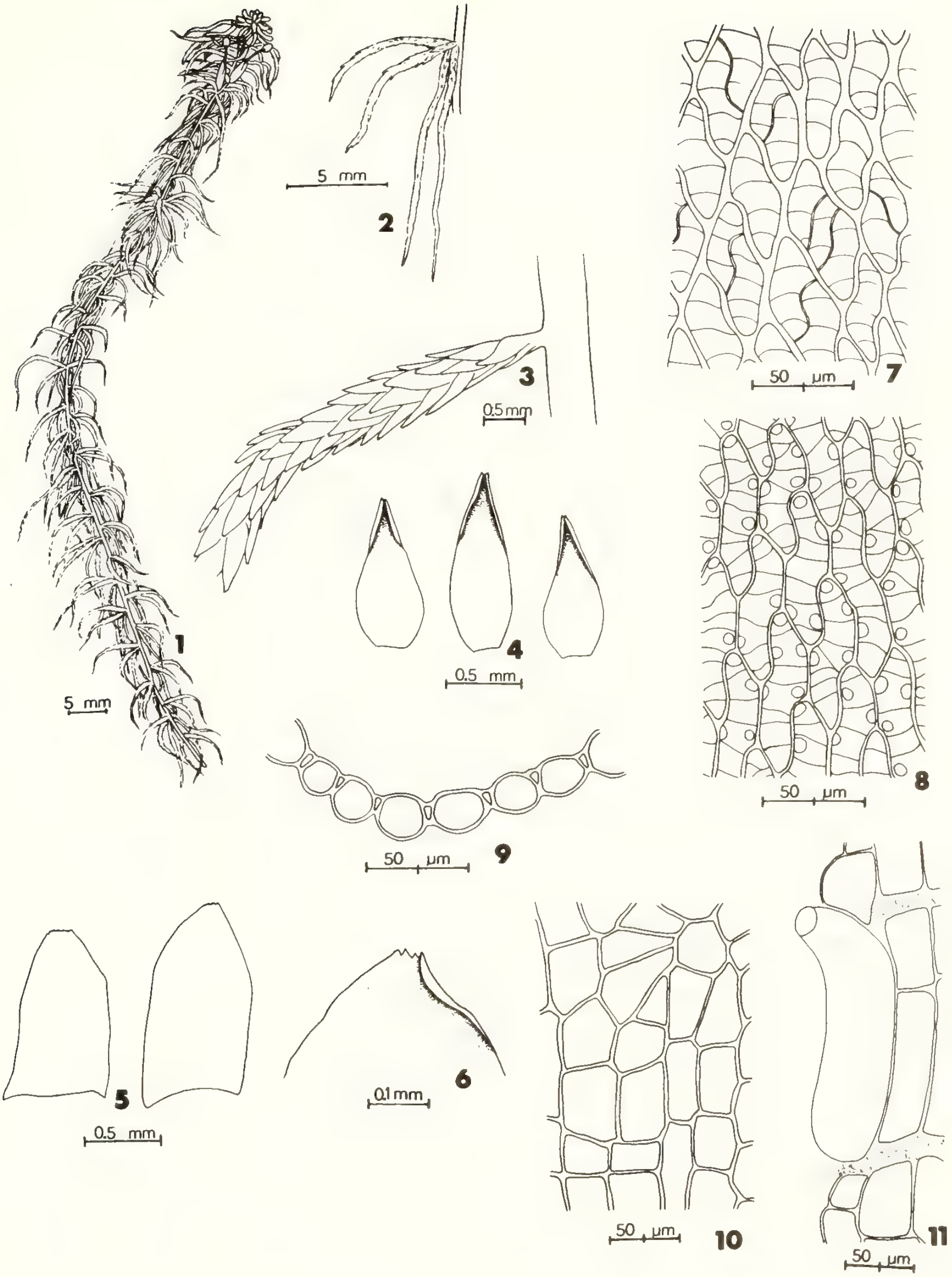
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Plate 37. *Sphagnum rubellum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

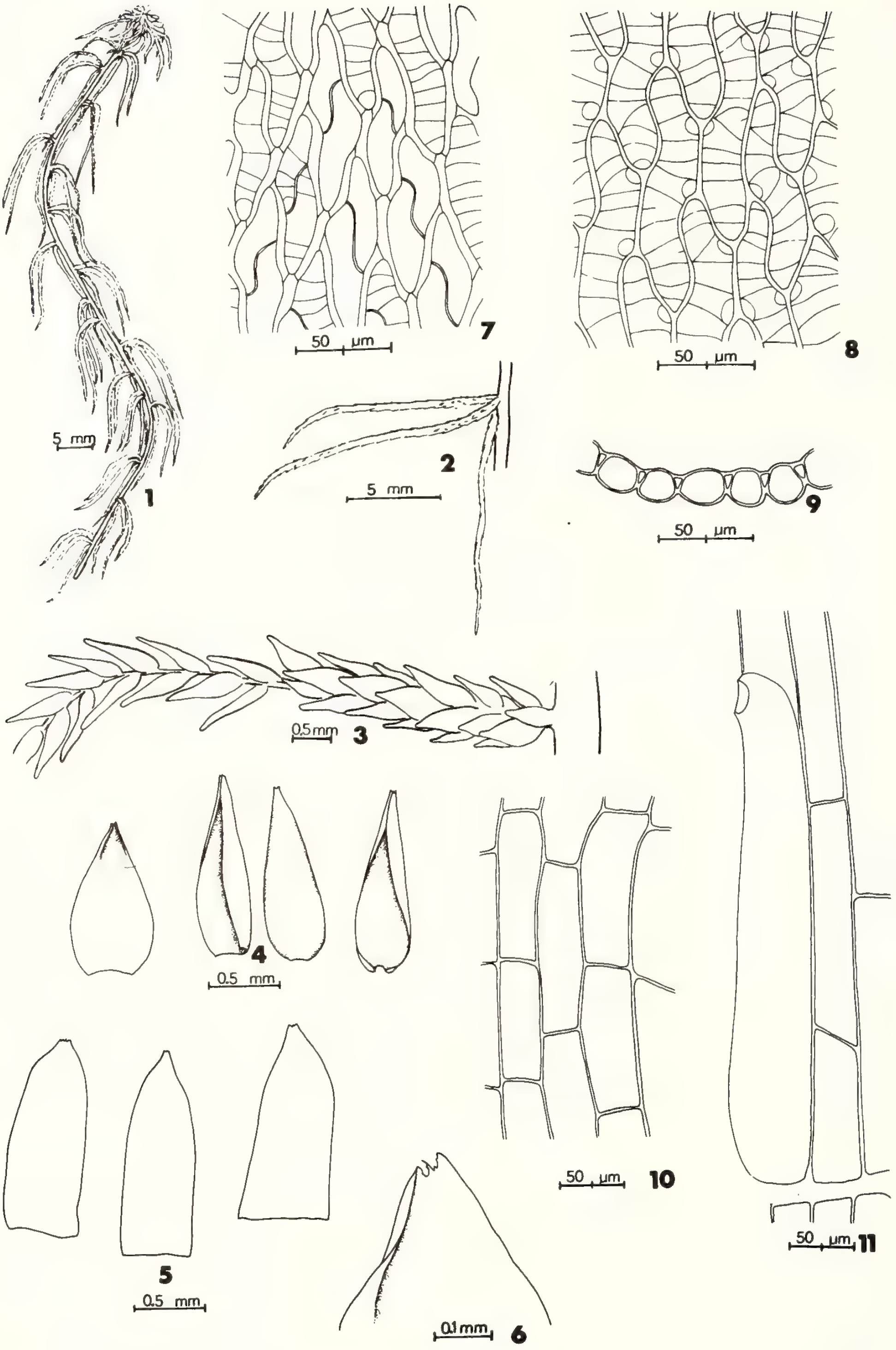
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Plate 38. *Sphagnum andersonianum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

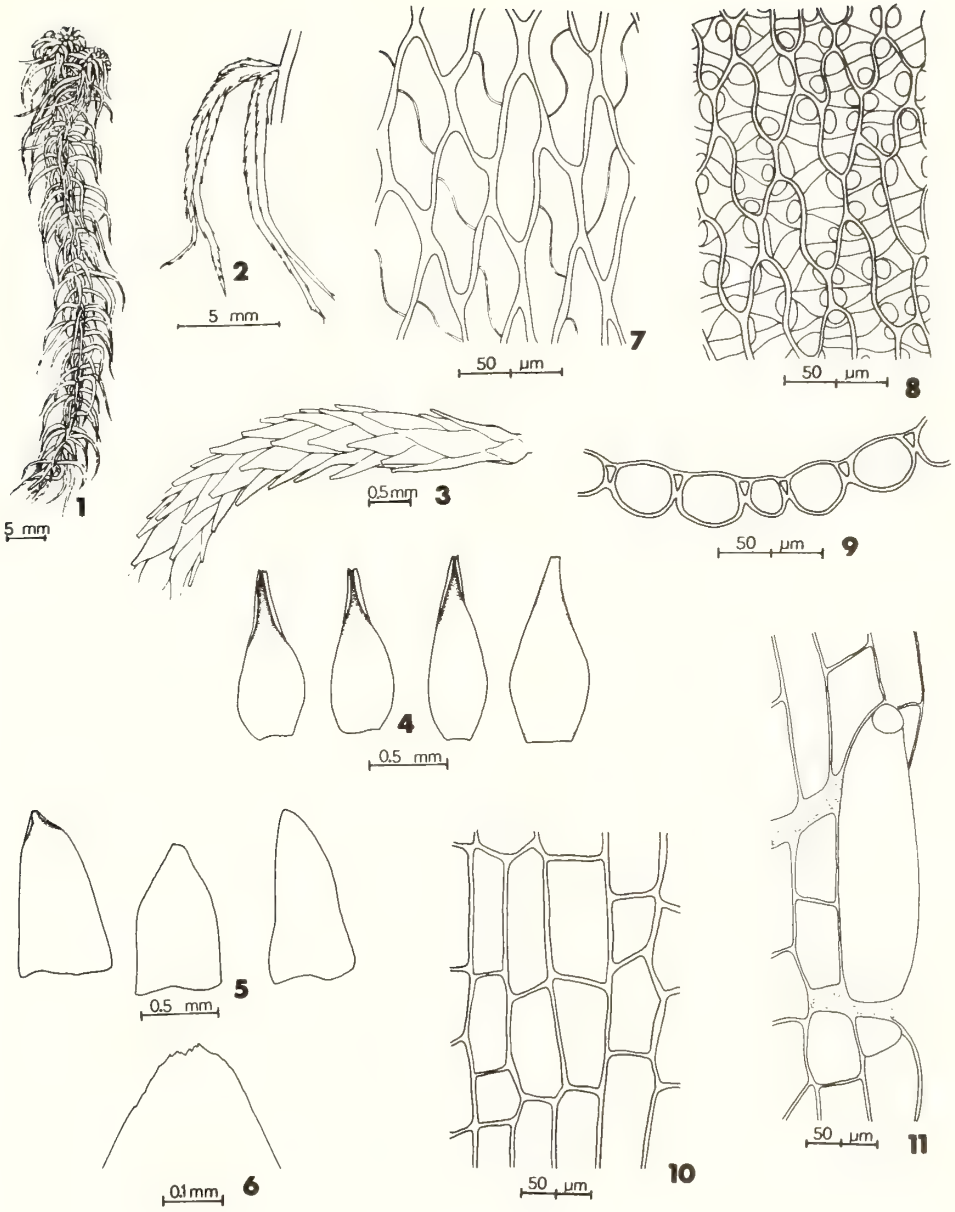
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Plate 39. *Sphagnum subtile*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Apical cells of stem leaf. 8. Median cells of branch leaf (dorsal surface). 9. Cross-section of median cells of branch leaf. 10. Outer cortical cells of stem. 11. Outer cortical cells of branch showing retort cell.

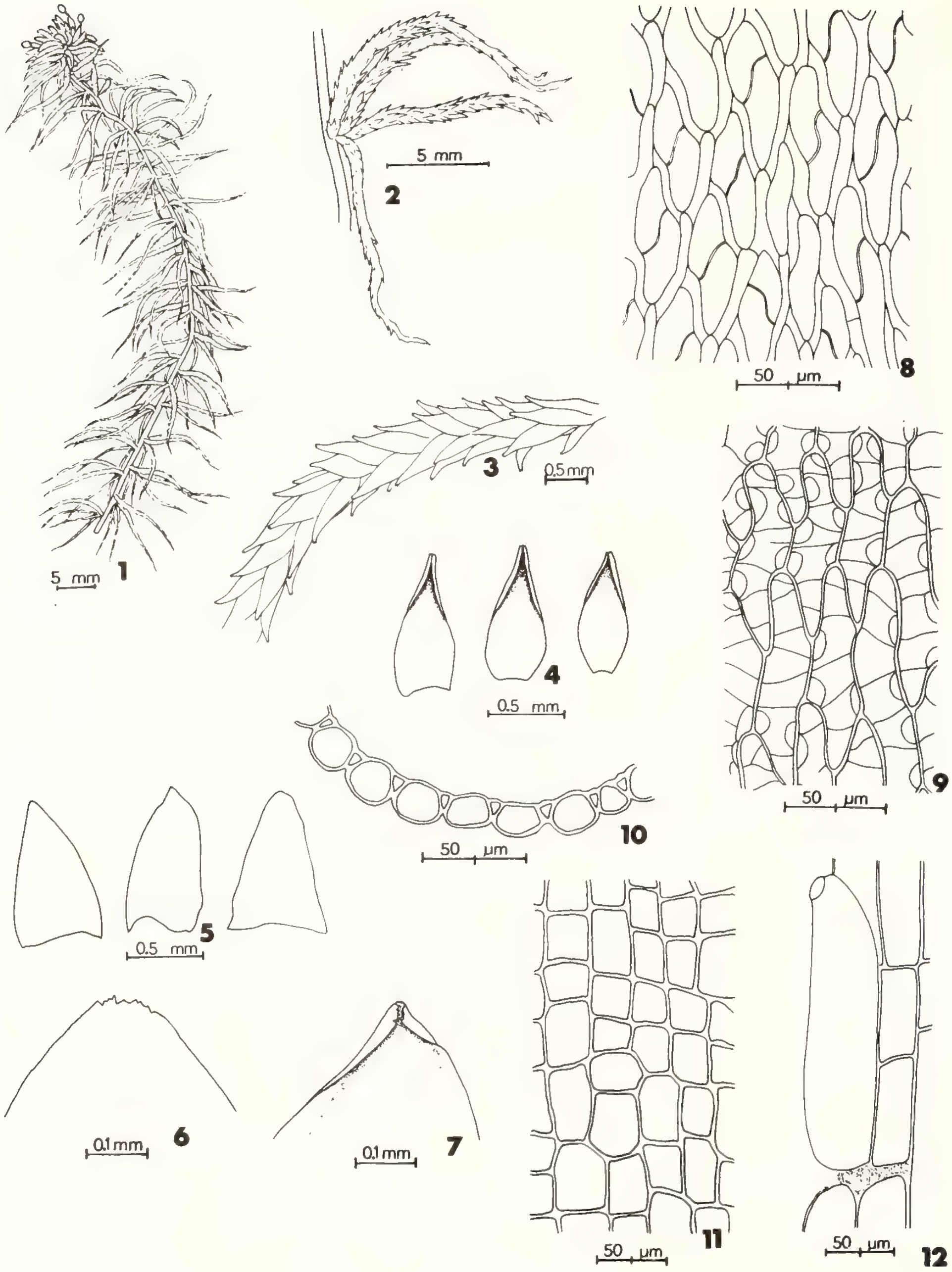
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Plate 40. *Sphagnum quinquefarium*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6–7. Apices of stem leaves. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell.

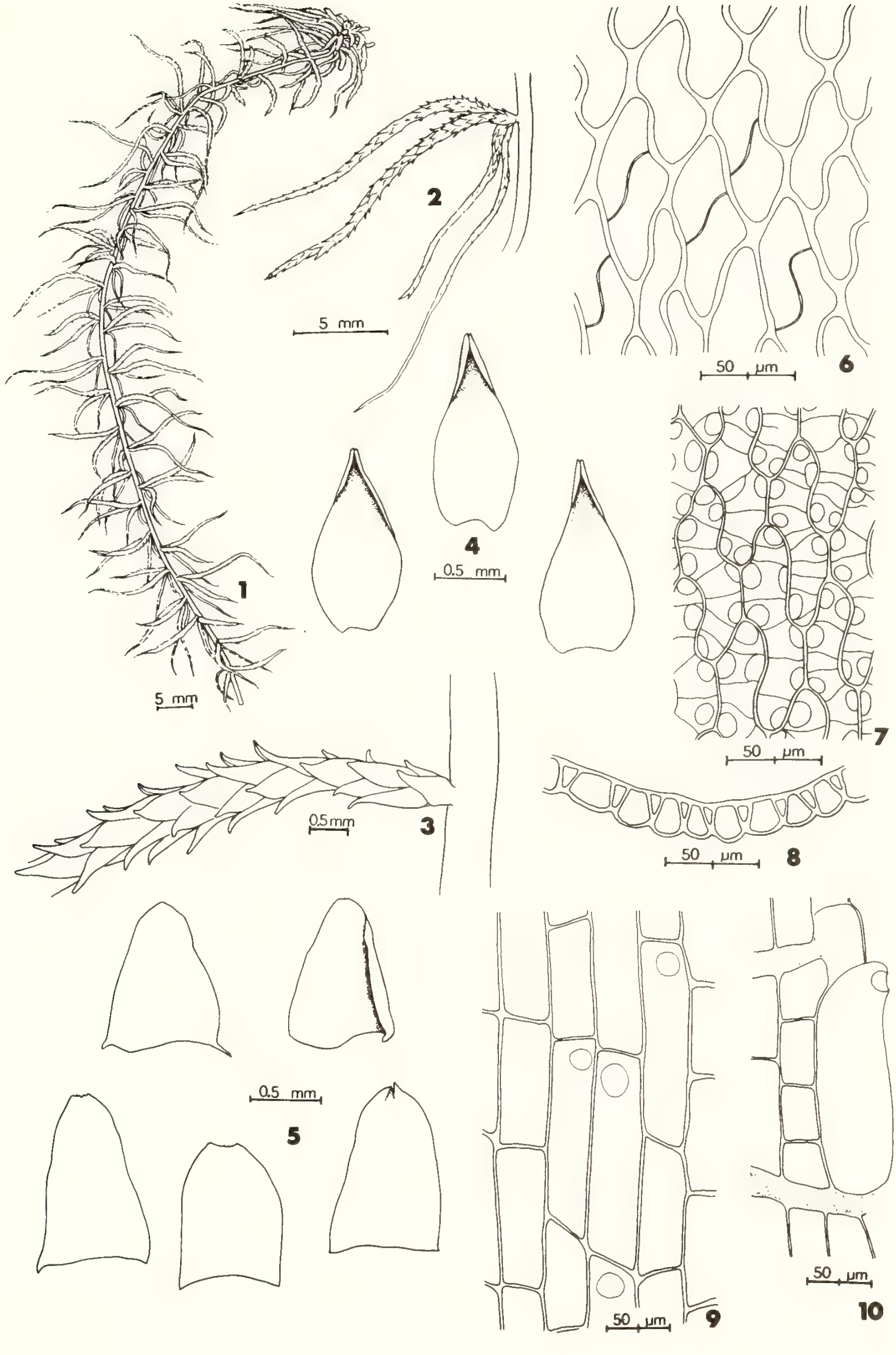
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Plate 41. *Sphagnum russowii*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apical cells of stem leaf. 7. Median cells of branch leaf (dorsal surface). 8. Cross-section of median cells of branch leaf. 9. Outer cortical cells of stem. 10. Outer cortical cells of branch showing retort cell.

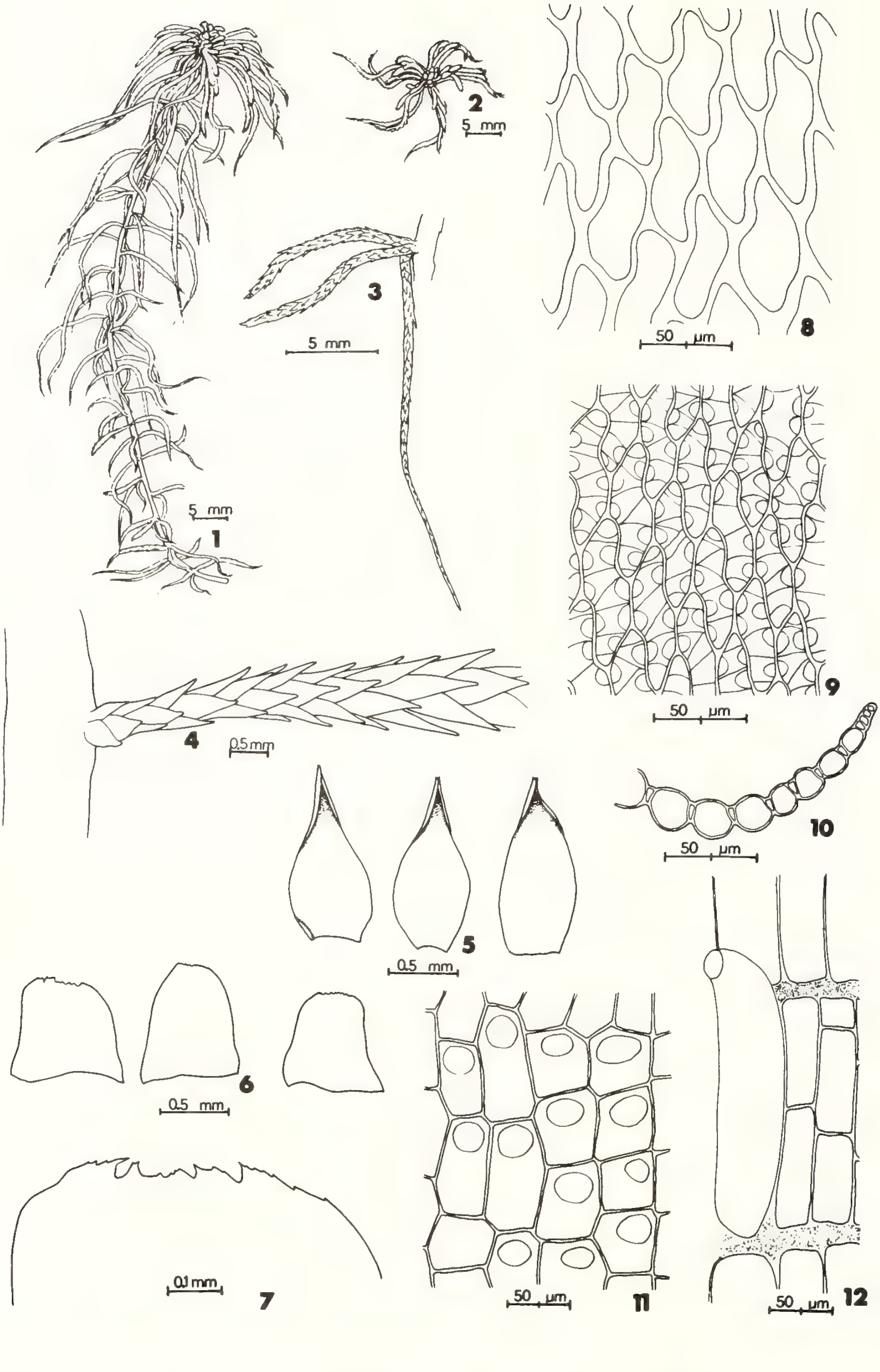
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Plate 42. *Sphagnum girgensohnii*. 1. Habit. 2. Top view of capitulum. 3. Fascicle of branches. 4. Portion of divergent branch. 5. Branch leaves. 6. Stem leaves. 7. Apex of stem leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cortical cells of branch showing retort cell.

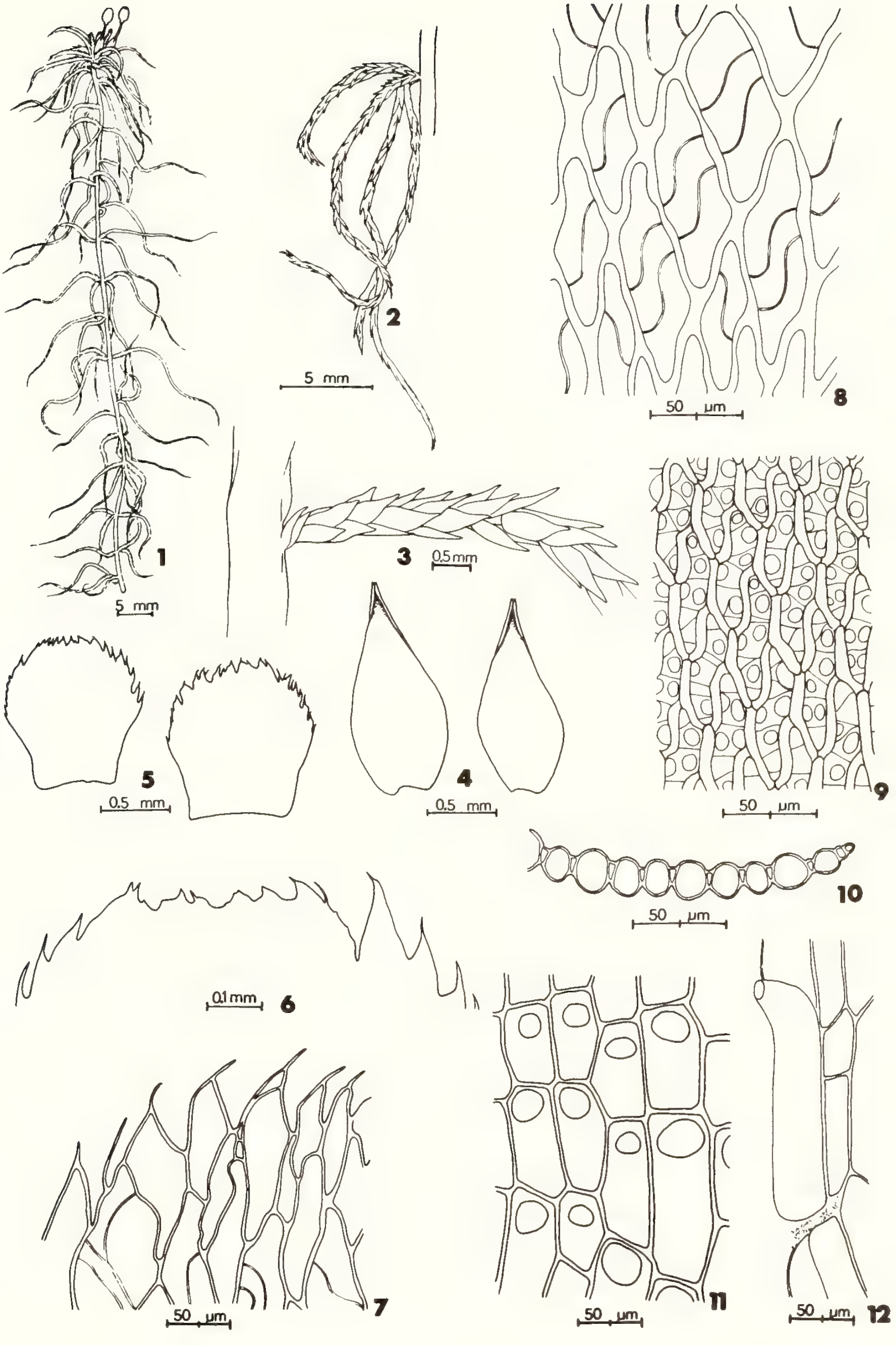
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Plate 43. *Sphagnum fimbriatum*. 1. Habit. 2. Fascicle of branches. 3. Portion of divergent branch. 4. Branch leaves. 5. Stem leaves. 6. Apex of stem leaf. 7. Portion of apex of stem leaf. 8. Apical cells of stem leaf. 9. Median cells of branch leaf (dorsal surface). 10. Cross-section of median cells of branch leaf. 11. Outer cortical cells of stem. 12. Outer cells of branch showing retort cell.

Family ANDREAEACEAE

Andreaea Hedw., Spec. Musc. 47. 1801.

Habit: In small tufts, often merging to cover large portions of substrate.
Colour: Brown or reddish brown to black at maturity.
Stems: Mostly less than 1 cm high, but up to 2 cm, erect, simple or often branched, fragile when dry, rhizoids at base, papillose.
Leaves: Erect-spreading to falcate, sometimes falcate-secund, concave to somewhat keeled, ovate or lanceolate, nondecurrent, acute to broadly obtuse. Perichaetial leaves abruptly narrowed to apex, clasping base of seta-like structure (pseudopodium) below capsule.
Leaf Margins: Plane, unistratose or bistratose, entire to weakly serrulate.
Costae: Lacking or single and strong, extending into apex.
Leaf Cells: Smooth to dorsally mamillose or papillose, the walls often thick and strongly pitted throughout leaf. Apical cells rounded to oval or transversely elongate to rectangular; median cells similar in shape to apical cells, often oval only on margins; basal cells long, oval to rectangular.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous. Perigonial buds on stems below perichaetial buds or separate stems bearing several perigonial buds appearing among female plants.
Calyptrae: Campanulate-mitrate, lacerate at base, naked, fugacious.
Capsules: Solitary, exserted on a short pseudopodium from stem apex, brown, reddish brown or black, ellipsoidal, erect, opening by 4 or rarely more vertical slits, the valves remaining united above and below, closed when moist, open when dry, shortly exserted above the clasping perichaetial leaves; columella persistent; capsule walls smooth.
Setae: Lacking. Capsule on pseudopodium that resembles a seta but is derived from the archegonium.
Annuli: Lacking.
Opercula: Lacking.
Peristomes: Lacking.
Spores: Yellowish brown to brown, ovoid, papillose, 20–45 μm in longest dimension.

1. Leaves narrowly lanceolate, costate .... 1. *A rothii*
1. Leaves ovate to ovate-lanceolate, ecostate .... 2. *A. rupestris*

1. **Andreaea rothii** Web. & Mohr, Bot. Taschenb. 386. 1807.
[Synonyms: *A. crassinervia* Bruch; *A. rupestris* A. Roth, *non* Hedw.]
PLATE 44

Small blackish plants with slender, erect stems, 1 or rarely 2 cm high. The black colour and costate leaves easily distinguish this species from *A. rupestris.* In addition, the leaves of *A. rothii* are narrower and appear to have a recurved margin because of the bistratose lamina. Also, the perichaetial leaves are abruptly narrowed to an acute or acuminate apex. Microscopically, the leaves have thinner cell walls and are nonpitted or apparently so, while the spores are somewhat larger, 30–45 μm in longest dimension.

Habitat: Often near water in exposed situations on granite or other noncalcareous rock in crevices or seepage areas. Usually in mountainous regions but occasionally found at low elevations in southern Nova Scotia.
Maritime Distribution: Rare. New Brunswick (Albert); Nova Scotia (Halifax, Hants, Shelburne).
Range: In North America along both coasts, from British Columbia to northern California and from Labrador south to Georgia and Tennessee; also in Colorado, Ohio, Ontario, and Michigan. Europe, *South America.
Chromosome Number: n = 10, 11.

2. Andreaea rupestris Hedw., Spec. Musc. 47. 1801.

[Synonyms: *A. alpestris* (Thed.) B.S.G.; *A. petrophila* Fürnr.]

PLATE 45

Small brown to reddish brown plants with slender, erect stems, 0.5–1.5 cm high. The brown or reddish brown colour and ecostate leaves serve to distinguish this species from *A. rothii*. Other features are the broad, entirely unistratose leaves and the perichaetial leaves that are abruptly narrowed to an obtuse apex. Microscopically, the leaf cells have thick walls that are strongly pitted and the spores are smaller, 20–35 μm in longest dimension.

Habitat: Similar to that of *A. rothii* except often in drier situations on vertical surfaces.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Shelburne, Victoria).

Range: Throughout most of northern North America, south to northern California, Colorado, Minnesota, Michigan, and in the mountains to Georgia. Greenland, Central and South America, Europe, Asia, Africa, Australia, *New Zealand, *Pacific Islands.

Chromosome Number: n = 10.

Remarks: This is a variable species throughout its range and many varieties have been described. However, in the Maritimes the plants are basically similar in morphology and all are referable to the var. *rupestris*.

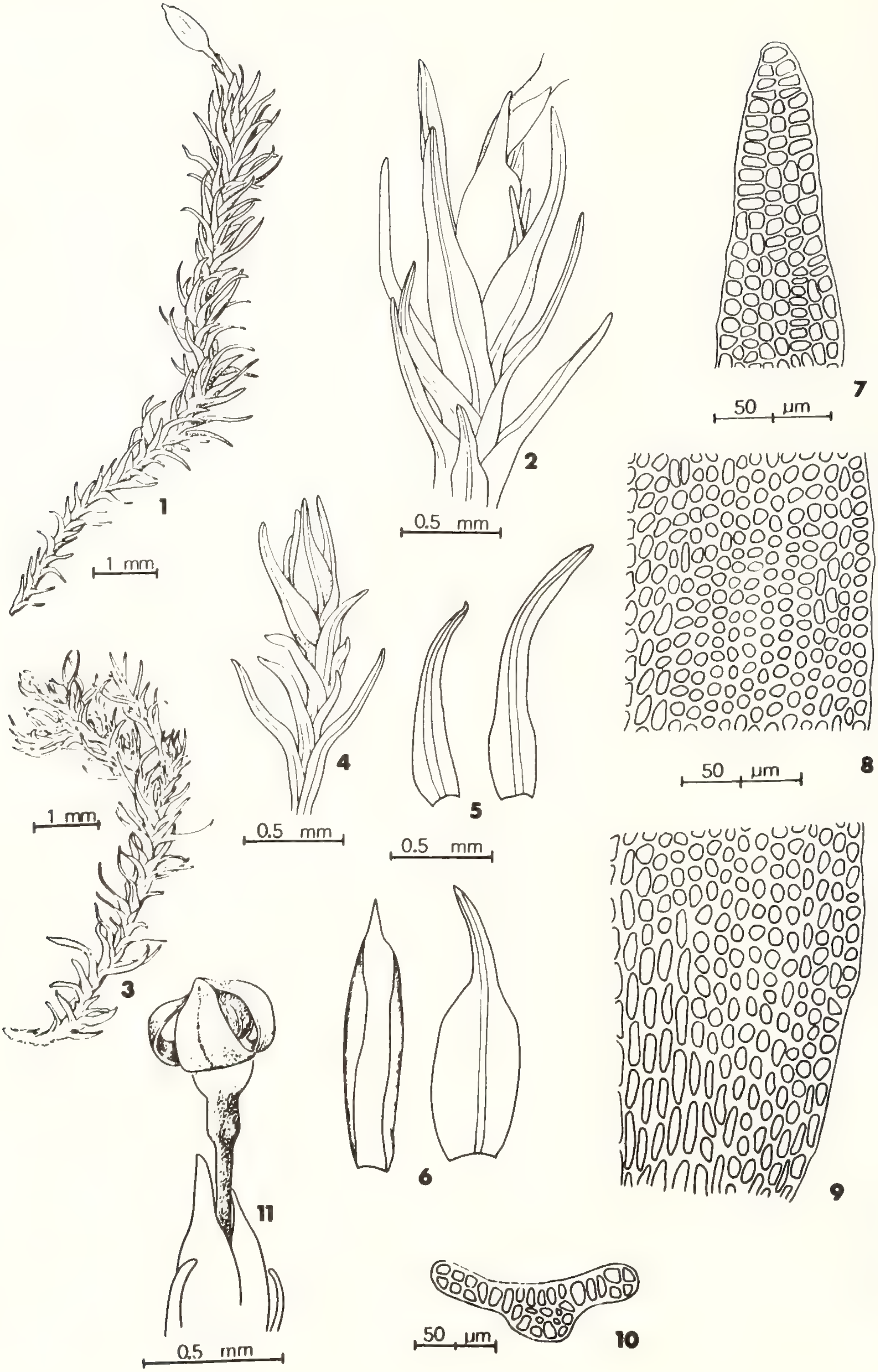
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Plate 44. *Andreaea rothii*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Portion of stem with perigonial bud. 5. Leaves. 6. Perichaetial leaves: inner (left), outer (right). 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near middle. 11. Capsule (dry).

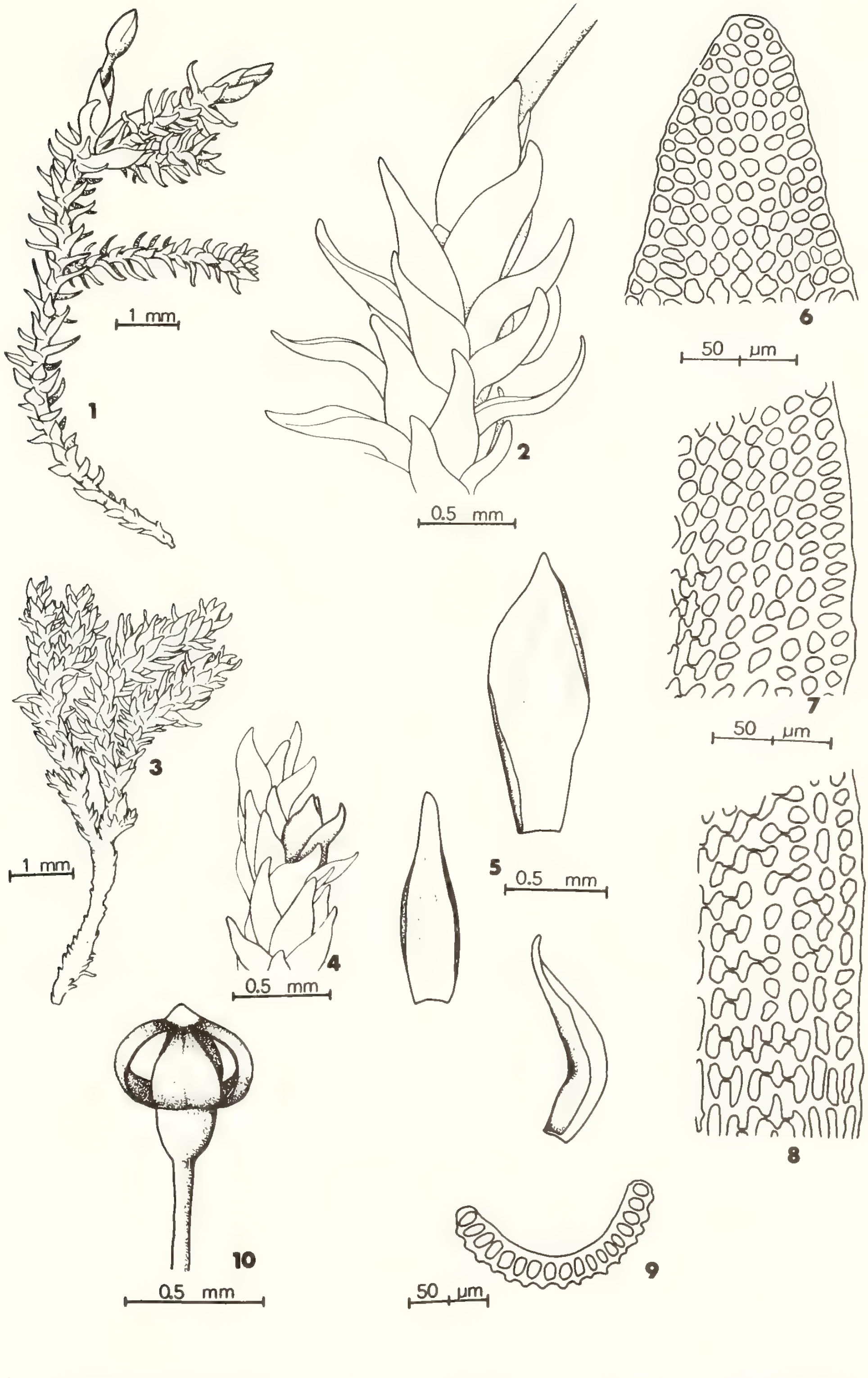
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Plate 45. *Andreaea rupestris*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Portion of stem with perigonial bud. 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near middle. 10. Capsule (dry).

Family FISSIDENTACEAE

Fissidens Hedw., Spec. Musc. 152. 1801.

Habit: Gregarious or in dense tufts (only in *F. osmundoides*).

Colour: Green to yellowish green above, often brown below.

Stems: 0.1–6.0 cm long, prostrate or erect and in tufts, simple or branched, complanate, rhizoids smooth or papillose, usually at base, sometimes macronemata and micronemata present above.

Leaves: Distichous, appearing to be inserted edgewise, distant to close and imbricate, flat, crisped and contorted or little changed when dry, unistratose or bistratose in streaks or patches, linear-lanceolate to ovate-lanceolate, the apex obtuse to acute; lamina consisting of three parts, (1) the vaginant lamina or leaf proper, i.e. the basal, sheathing, conduplicate portion clasping the stem and often the leaf above, extending 1/3–2/3 length of leaf, (2) the ventral or apical lamina, the portion above the vaginant lamina and on the same side of the costa, sometimes lacking in perigonial and perichaetial leaves, and (3) the dorsal or inferior lamina, the portion extending from base to apex on the side of the costa opposite the vaginant lamina, well-developed and often as broad as the ventral lamina.

Leaf Margins: Plane, unistratose to multistratose, entire to serrate, with or without a border of differentiated cells, the border cells linear or short, sometimes lighter in colour.

Costae: Single, ending below apex to shortly excurrent.

Leaf Cells: Smooth to mamillose, the walls thick or thin, nonpitted. Median cells of apical and dorsal laminae above vaginant lamina round, hexagonal or irregularly angled, mostly less than 2:1, the basal cells often rectangular and larger.

Asexual Reproductive Bodies: Lacking or reportedly present (only in *F. taxifolius*), dark brown to nearly black, globose or irregularly shaped tubers, 300–700 µm in longest dimension.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate or rarely mitrate, naked.

Capsules: 1 per perichaetium, on a seta, lateral in some species, terminal in others, brown to reddish brown or yellow to yellowish brown, ovoid to cylindric, straight to somewhat arcuate, erect to horizontal, smooth, often contracted below mouth when dry.

Setae: Straight or flexuose, not or somewhat twisted, yellow to reddish brown.

Annuli: 1–3 rows of cells, persistent.

Opercula: Conic to rostrate, straight or arcuate, sometimes as long as urn or nearly so.

Peristomes: Single, of 16, red teeth, papillose below, usually becoming spirally thickened above, usually divided to the middle or below to form 2 trabeculate segments.

Spores: Green, yellowish green or brown, globose to ellipsoidal, papillose, 10–26 µm in longest dimension.

1. Leaves wholly or partly bordered with narrow, elongated cells 2
    2. Leaf border weak, confined to basal part of leaf .... 8. *F. exiguus*
    2. Leaf border strong, extending to leaf apex or nearly so 3
        3. Leaf border extending to apex; plants autoicous .... 6. *F. bryoides*
        3. Leaf border ending below apex; plants dioicous .... 7. *F. viridulus*
1. Leaves lacking border of elongated cells 4
    4. Leaves irregularly serrate near apex, often bordered with a band of lighter coloured cells 5
        5. Leaf cells averaging 12 µm or more in longest dimension; leaf lamina unistratose .... 5. *F. adiantoides*
        5. Leaf cells smaller, averaging less than 12 µm in longest dimension; leaf lamina with scattered patches of bistratose regions .... 4. *F. cristatus*
    4. Leaves finely and evenly crenulate, sometimes serrulate near apex, not bordered with a band of lighter cells 6
        6. Costa ending 3–10 cells below apex; sporophyte arising from stem apex .... 1. *F. osmundoides*
        6. Costa ending 1–2 cells below apex or reaching apex, often excurrent as a short mucro or apiculus; sporophyte arising laterally from stem 7

7. Costa excurrent; leaves apiculate, unistratose; plants autoicous .... 2. *F. taxifolius*

7. Costa ending 1–2 cells below apex or percurrent; leaves mucronate, bistratose in patches; plants dioicous .... 3. *F. bushii*

1. **Fissidens osmundoides** Hedw., Spec. Musc. 153. 1801.
PLATE 46

Medium sized, dioicous plants, up to 3 cm long, 0.2–0.3 cm wide, in dense tufts, with the sporophytes arising from the stem apices.

Habitat: In shaded situations on soil banks and hummocks, humus, tree stumps, boulders, and often on noncalcareous seepy cliff faces and ledges.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, King's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Cumberland, Digby, Guysborough, Inverness, Kings, Victoria).

Range: Alaska to Oregon, east to Alberta and Montana, across the northern part of North America to Labrador and Greenland, south to Georgia, Tennessee, and Arkansas. Europe, *South America, *Asia.

Chromosome Number: n = 12, 16.

2. **Fissidens taxifolius** Hedw., Spec. Musc. 155. 1801.
PLATE 47

Medium sized, autoicous plants, up to 1.5 cm long, 0.2–0.3 cm wide, with the sporophytes arising laterally from the stems.

Habitat: Not reported for the Maritime collection but known elsewhere to occur in shaded situations on moist soil or soil over rock.

Maritime Distribution: Very rare or perhaps overlooked. Nova Scotia (Hants, Kings). Additional localities should be sought in southern Nova Scotia.

Range: British Columbia, south to Oregon; Arizona; widespread in the central provinces and states; in eastern North America from Quebec, Maine and central Nova Scotia, south to Florida and the Gulf States. Europe, *Central and *South America, Asia, *Africa.

Chromosome Number: n = 12, 13 + 1.

Remarks: After studying collections in eastern United States it was discovered that *Fissidens taxifolius* often appears dioicous, and culture studies may indeed prove this to be true. Sterile stems, stems with only archegonia, and stems with only antheridia all occur in intimate association in a rhizoid mat. Stems with antheridia sometimes get quite large and several perigonial buds are produced on one branch (or plant?). Brown (1919) points out the need to determine monoicism and dioicism by culture studies rather than by morphological examination. Many of our mosses reported to be dioicous may instead be monoicous with one spore producing protonema bearing male shoots and female shoots. Male or female shoots, produced along one protonemal filament can easily become detached and grow independently making the species appear dioicous, when in reality it was originally monoicous.

Rhizoidal gemmae have been reported by Whitehouse (1966) on British plants, but none were seen on the Maritime plants.

3. **Fissidens bushii** (Card & Thér.) Card. & Thér., Bot. Gaz. 37: 365. 1904.
F. subbasilaris var. *bushii* Card. & Thér., Bot. Gaz. 30: 16. 1900.
PLATE 48

Small, dioicous plants, up to 0.8 cm long, 0.2–0.3 cm wide, with the sporophytes arising laterally from the stems. Close to *F. taxifolius* but readily distinguished by the leaves with a shorter costa, a mucronate apex and bistratose patches on the lamina, as well as by the sex difference.

Habitat: The single Maritime collection was found on a sandy soil bank in a woodland.

Maritime Distribution: Rare. Nova Scotia (Digby). Known only from one locality, 11.2 km southwest of Acaciaville, where it was collected 28 July 1974 (*Ireland 17908*).

Range: Endemic to eastern North America, occurring from Maine, southern Quebec, Ontario, and Nova Scotia, south to Florida and Texas.

Chromosome Number: Unreported.

4. **Fissidens cristatus** Wils. *ex* Mitt., J. Linn. Soc. Bot. Suppl. 1: 137. 1859.
[Synonym: *F. decipiens* De Not.]
PLATE 49

Medium sized plants, up to 3 cm long, 0.3–0.4 cm wide, with the sporophytes arising laterally from the stems. At times confused with *F. adiantoides* but distinguished by the smaller leaf cells (6–12 μm) and apical and dorsal laminae that have scattered patches of bistratose regions.

Habitat: In woods on soil banks and hummocks, tree stumps, humus, bases of trees, and sometimes on calcareous rocks and ledges near waterfalls.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, King's, Saint John, Victoria, York); Nova Scotia (Annapolis, Colchester, Digby, Hants, Inverness, Kings, Victoria).

Range: In eastern North America from Newfoundland, south to Florida, west to the Rocky Mts.; also known from Arizona and Alaska. Europe, Asia, *Africa.

Chromosome Number: n = 12, 12 + 1, 13 + 2, 16.

Remarks: Reported to be monoicous (autoicous) by some authors and dioicous by others. The Maritime plants are pseudomonoicous with dwarf male plants being rare on the female plants. The male plants occur singly or in a row attached to the same rhizoid in the pocket of the vaginant lamina.

5. **Fissidens adiantoides** Hedw., Spec. Musc. 157. 1801.
[Synonym: *F. adiantoides* var. *immarginatus* Lindb. *ex* Lesq. & James]
PLATE 50

Largest of our species, the plants up to 6 cm long, 0.5 cm wide, with the sporophytes arising laterally from the stems. Often confused with *F. cristatus* but distinguished by the larger leaf cells (12–20 μm) and the apical and dorsal laminae that are entirely unistratose.

Habitat: In woods on moist soil banks, rotten logs, humus, woody debris, or often on calcareous rocks and cliffs beside streams, sometimes in the spray of waterfalls.

Maritime Distribution: Common. New Brunswick (Albert, King's, Madawaska, Restigouche, Saint John, Victoria, Westmorland); Nova Scotia (Cape Breton, Cumberland, Digby, Guysborough, Hants, Halifax, Inverness, Kings, Victoria).

Range: Alaska to California, extending eastward to the Rocky Mts., rare in the Northwest Territories, becoming more common in Labrador and northeastern North America, extending southward to Arkansas and Florida. Greenland, Europe, *South America, *Asia, *Africa, *Australia, *New Zealand.

Chromosome Number: n = 24.

Remarks: Anderson and Bryan (1956), who made a detailed cytotaxonomic investigation of this species and *F. cristatus*, did an excellent job of clarifying the taxonomic confusion that has centered around these two taxa. They reported that they could not confirm the reports by earlier bryologists that *F. adiantoides* is sometimes monoicous. Although most of the Maritime collections of *F. adiantoides* are dioicous, one Nova Scotia collection (*Schofield 6213* CANM) was discovered that contained a single plant that was monoicous (i.e., autoicous with a perigonial bud at the base of a branch near the middle of the plant).

6. **Fissidens bryoides** Hedw., Spec. Musc. 153. 1801.
[Synonym: *F. limbatus* Sull.]
PLATE 51

Small, autoicous plants, 1–8 mm long, 2 mm wide or less. Very similar to *F. viridulus* but distinguished by its leaf border, which extends to the apex where it is often confluent with the costa, and by its autoicous condition.

Habitat: Usually in woods on limestone or sandstone rocks and boulders near streams, rarely on tree stumps.

Maritime Distribution: Frequent. New Brunswick (Kent, King's, Restigouche); Nova Scotia (Antigonish, Hants, Inverness, Kings); Prince Edward Island (Queens).

Range: Alaska, south to California, east to Montana and Wyoming; South Dakota, Minnesota; Ontario to northern Nova Scotia and Prince Edward Island, south to Texas and Florida. Europe, *Asia, *Africa, *South America.

Chromosome Number: n = 5, 10, 12.

7. **Fissidens viridulus** (Sw.) Wahlenb., Fl. Lapp. 334. 1812.
Dicranum viridulum Sw., Monthl. Rev. 34: 538. 1801.
[Synonyms: *F. minutulus* Sull.; *F. pusillus* Wils.]
PLATE 52

Small, dioicous plants, 1–6 mm long, 1–2 mm wide. Close to *F. bryoides* but distinguished by its leaf border that ends below the apex so that it is not confluent with the costa and by the dioicous condition.

Habitat: On sandstone rocks and boulders beside streams and creeks.

Maritime Distribution: Frequent. New Brunswick (Albert, York); Nova Scotia (Colchester); Prince Edward Island (Kings).

Range: Not clear because of the taxonomic confusion with *F. bryoides* but probably with a similar distribution.

Chromosome Number: n = 5, 10, 11.

8. Fissidens exiguus Sull., Musc. Allegh. 182. 1845.

PLATE 53

Small, dioicous plants, 1–6 mm long, 1–2 mm wide. Somewhat similar to both *F. bryoides* and *F. viridulus* but distinguished by its weak border of elongated cells that is confined to the vaginant lamina.

Habitat: On sandstone rocks and boulders beside streams and creeks.

Maritime Distribution: Rare. New Brunswick (Restigouche); Prince Edward Island (Kings).

Range: Southeastern Canada, west to Ontario, south to *Florida, west to the Rocky Mts., and in the Northwest Territories. *Europe, *Central America.

Chromosome Number: n = 11.

Remarks: Trying to separate *F. exiguus, F. bryoides* and *F. viridulus* morphologically is often very frustrating since the characters are extremely variable and often seem to intergrade. Crum (1976) and Pursell (1976) also have experienced a great deal of difficulty distinguishing the taxa and state the case very well. They both consider *F. exiguus* and *F. viridulus* synonyms of *F. bryoides*.

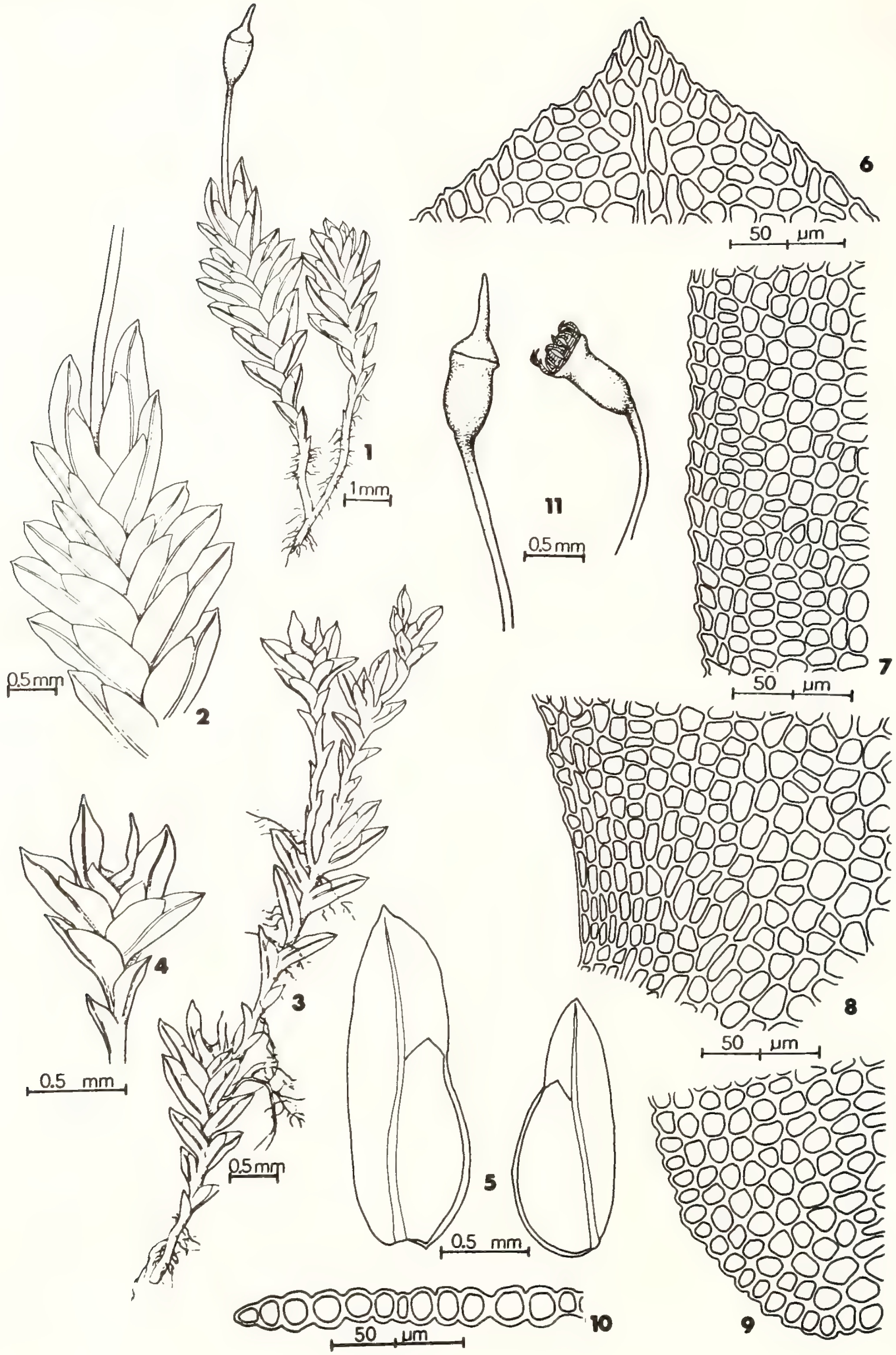
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Plate 46. *Fissidens osmundoides*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Portion of stem with perigonial bud. 5. Leaves. 6–9. Leaf cells (6, apical. 7, median-marginal of vaginant lamina. 8, alar of vaginant lamina. 9, alar of dorsal lamina.). 10. Cross-section of marginal cells above vaginant lamina. 11. Capsules (dry).

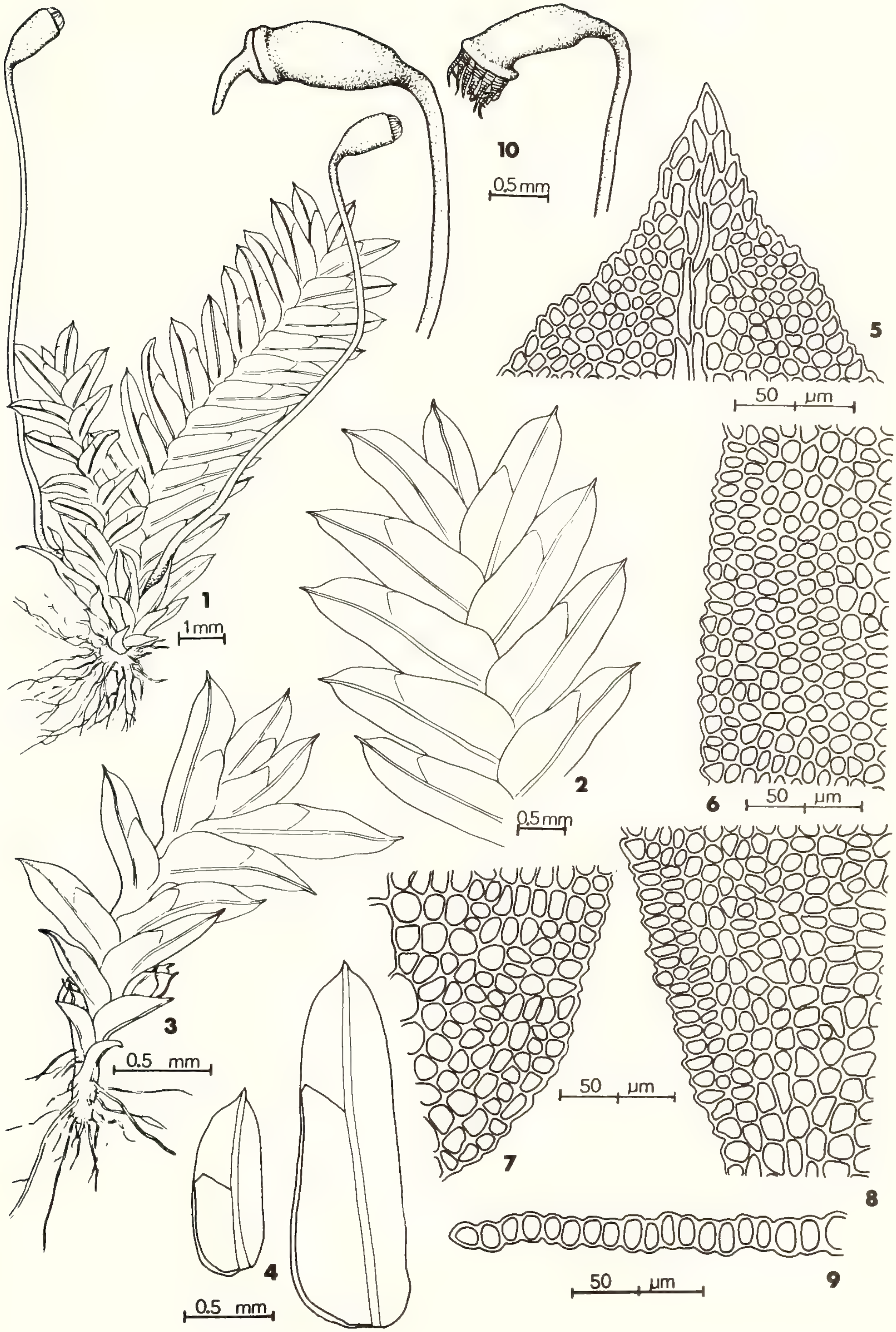
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Plate 47. *Fissidens taxifolius*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median-marginal of vaginant lamina. 7, alar of dorsal lamina. 8, alar of vaginant lamina.). 9. Cross-section of marginal cells above vaginant lamina. 10. Capsules (dry).

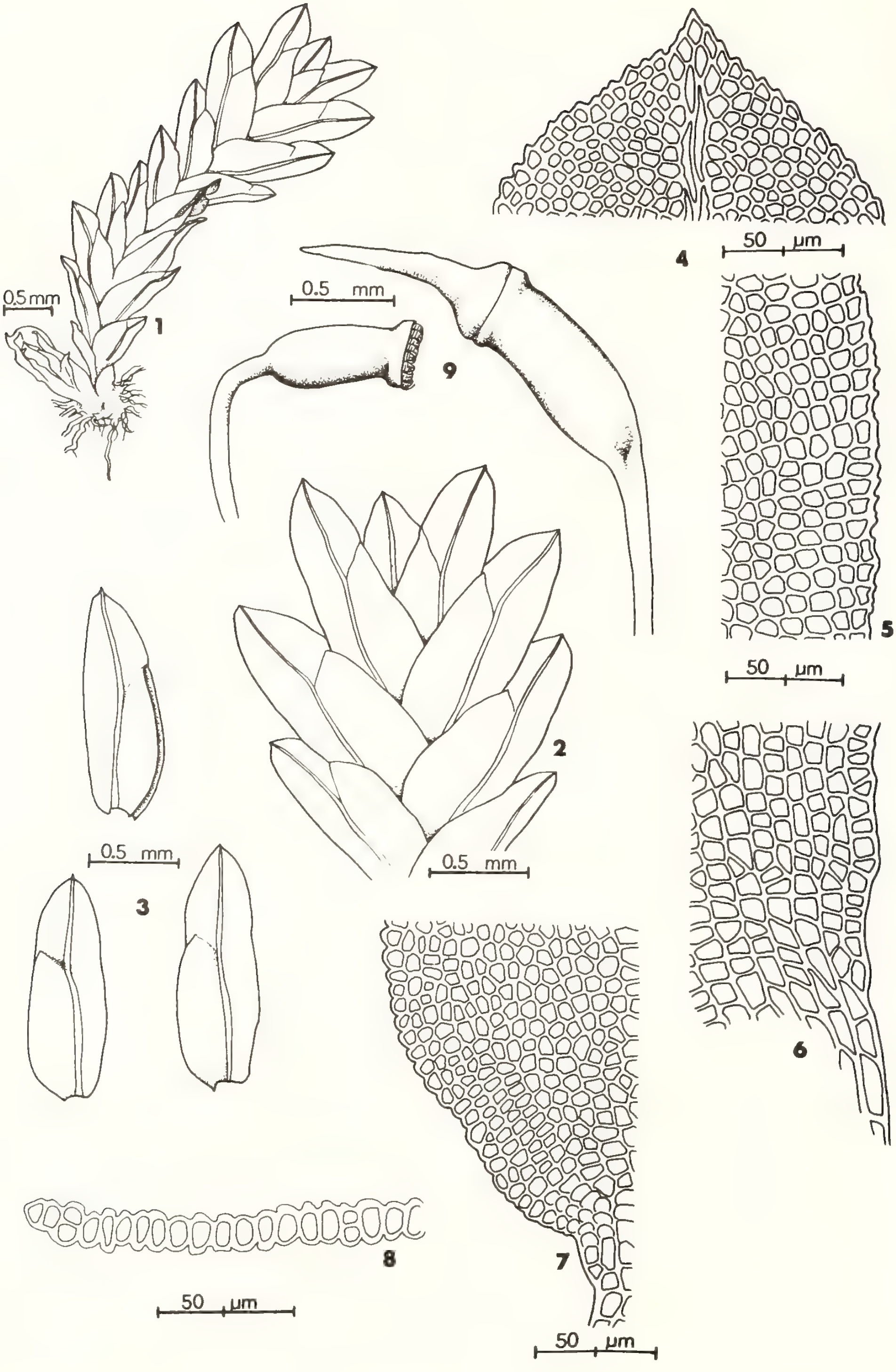
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Plate 48. *Fissidens bushii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median-marginal of vaginant lamina. 6, alar of vaginant lamina. 7, alar of dorsal lamina.). 8. Cross-section of marginal cells above vaginant lamina. 9. Capsules (dry).

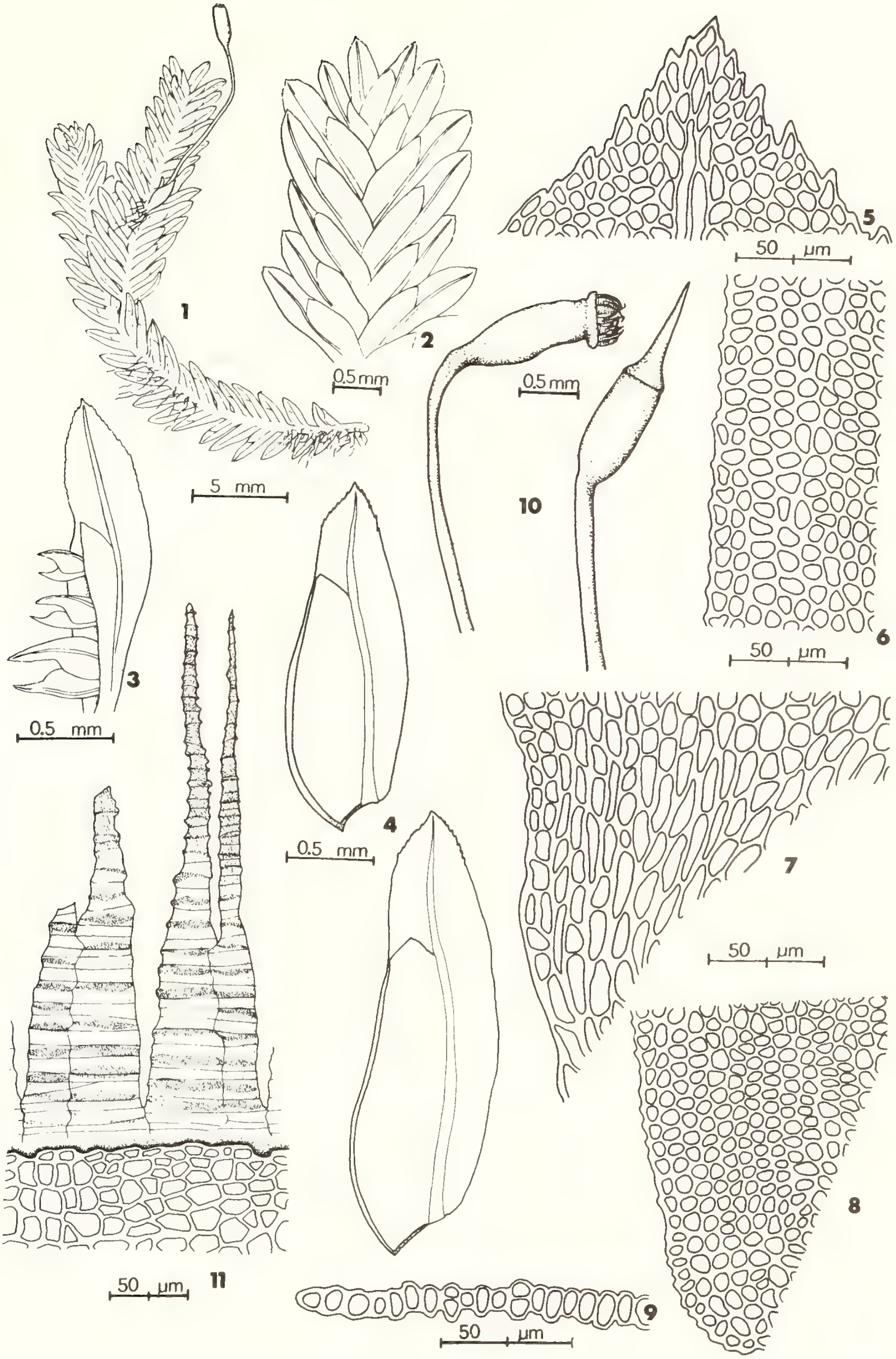
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Plate 49. *Fissidens cristatus*. 1. Habit. 2. Portion of stem. 3. Dwarf male plants. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median-marginal of vaginant lamina. 7, alar of vaginant lamina. 8, alar of dorsal lamina.). 9. Cross-section of marginal cells above vaginant lamina. 10. Capsules (dry). 11. Peristome teeth.

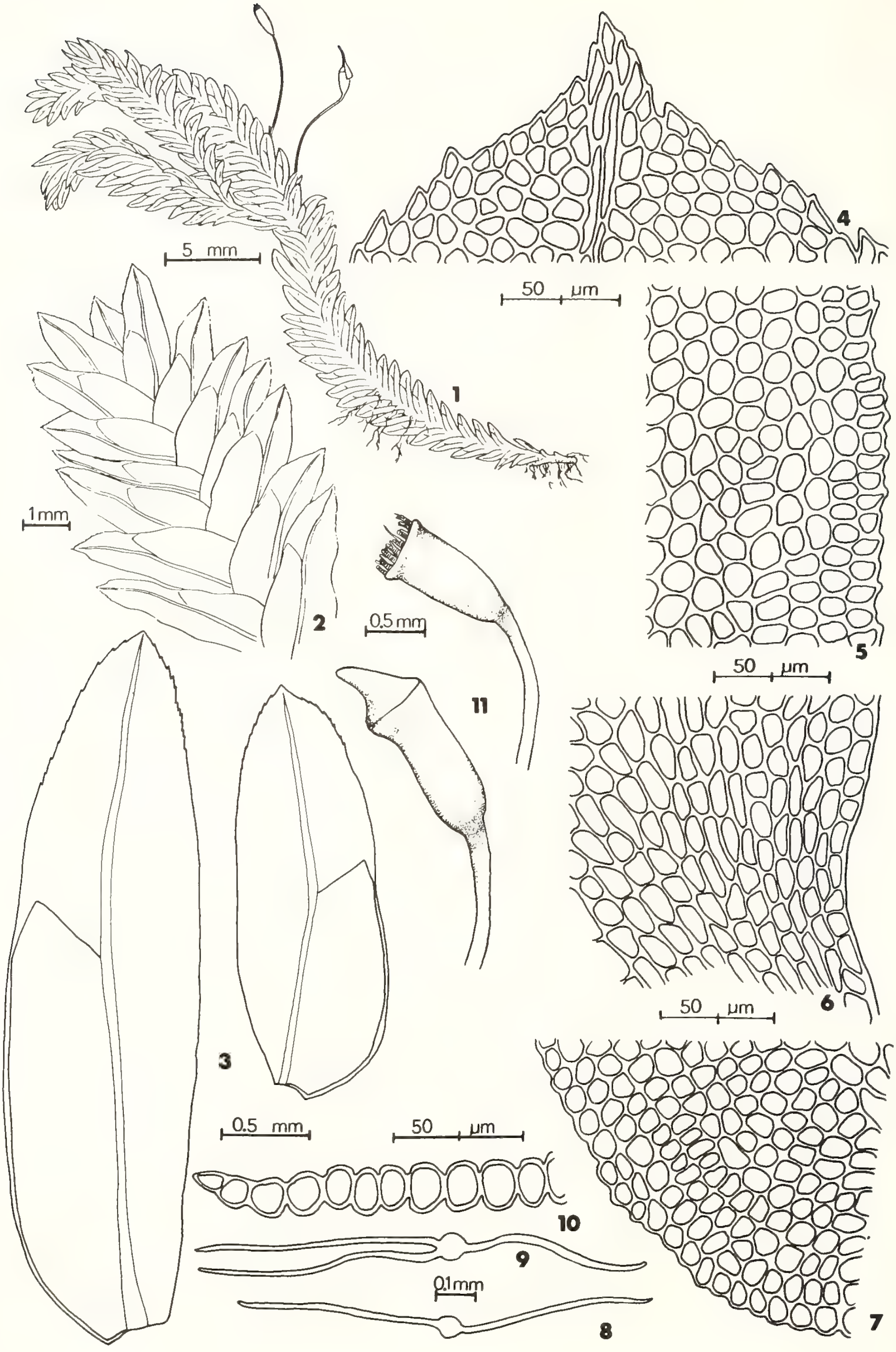
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Plate 50. *Fissidens adiantoides*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median-marginal of vaginant lamina. 6, alar of vaginant lamina. 7, alar of dorsal lamina.). 8. Cross-section of leaf above vaginant lamina. 9. Cross-section of leaf through vaginant lamina. 10. Cross-section of marginal cells above vaginant lamina. 11. Capsules (dry).

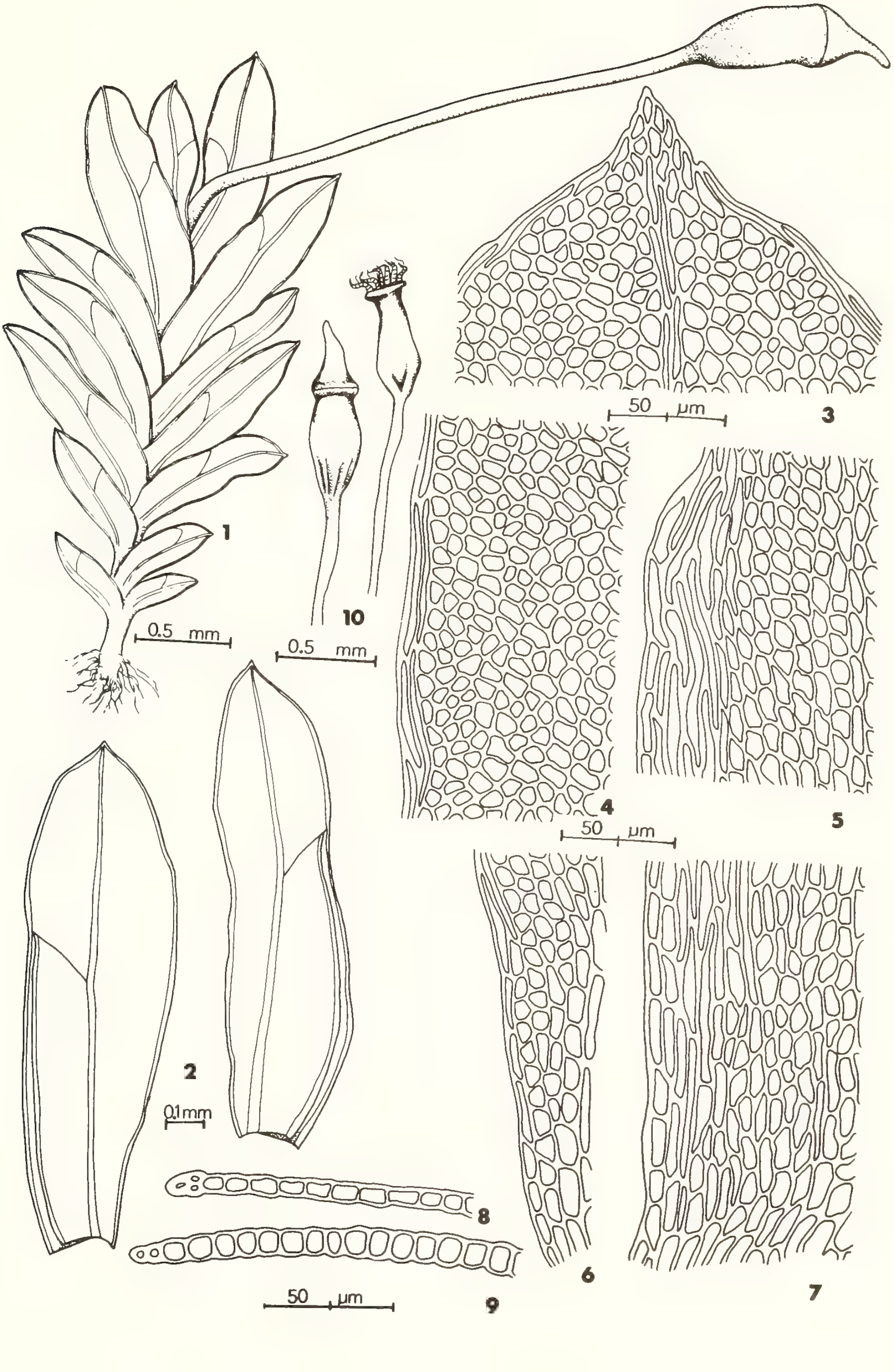
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Plate 51. *Fissidens bryoides*. 1. Habit. 2. Leaves. 3–7. Leaf cells (3, apical. 4, median-marginal of dorsal lamina. 5, median-marginal of vaginant lamina. 6, alar of dorsal lamina. 7, alar of vaginant lamina.). 8. Cross-section of marginal cells of vaginant lamina. 9. Cross-section of marginal cells above vaginant lamina. 10. Capsules (dry).

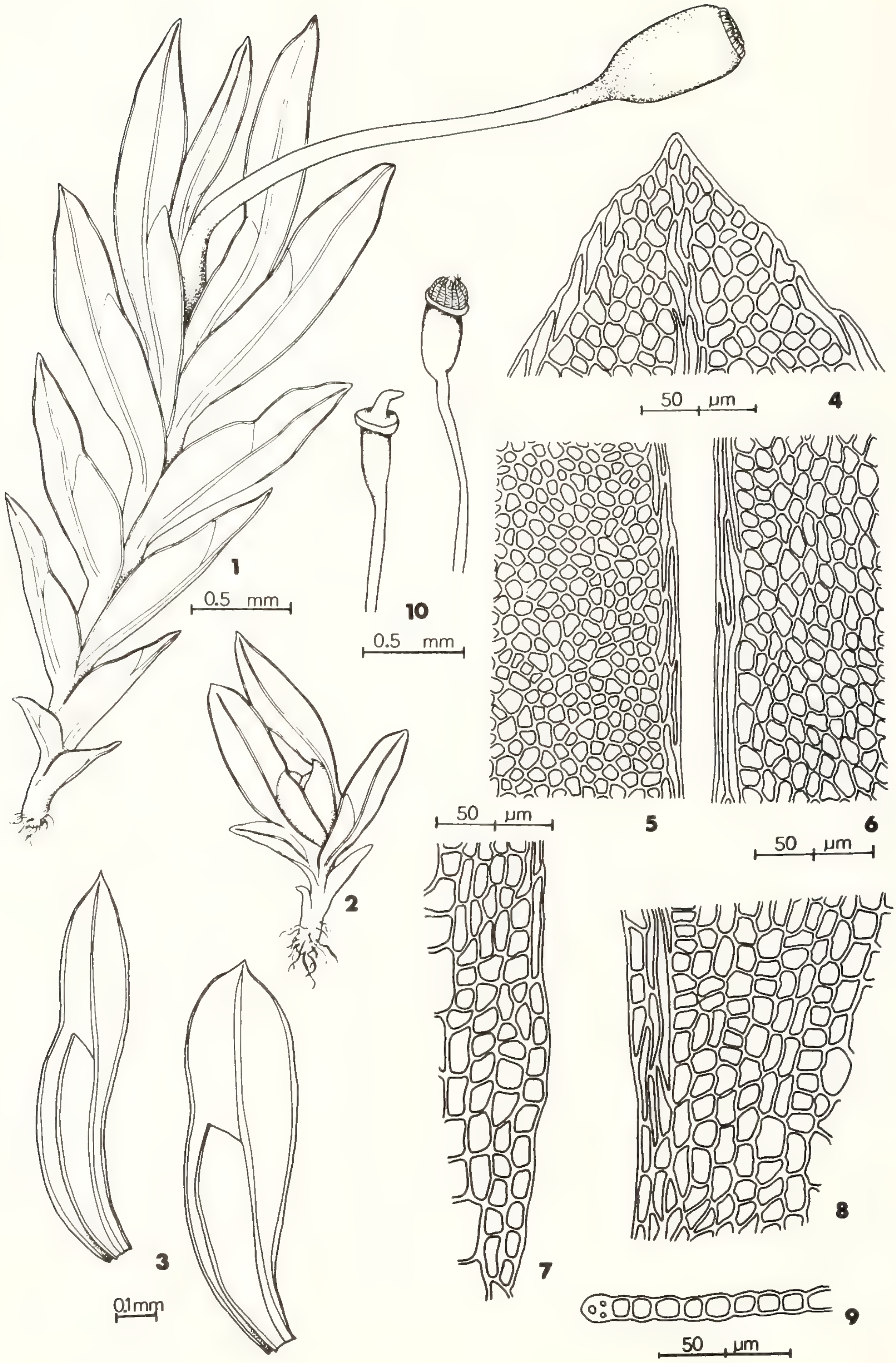
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Plate 52. *Fissidens viridulus*. 1. Habit. 2. Male plant. 3. Leaves. 4–8. Leaf cells (4, apical. 5, median-marginal of dorsal lamina. 6. median-marginal of vaginant lamina. 7. alar of dorsal lamina. 8. alar of vaginant lamina.) 9. Cross-section of marginal cells above vaginant lamina. 10. Capsules (dry).

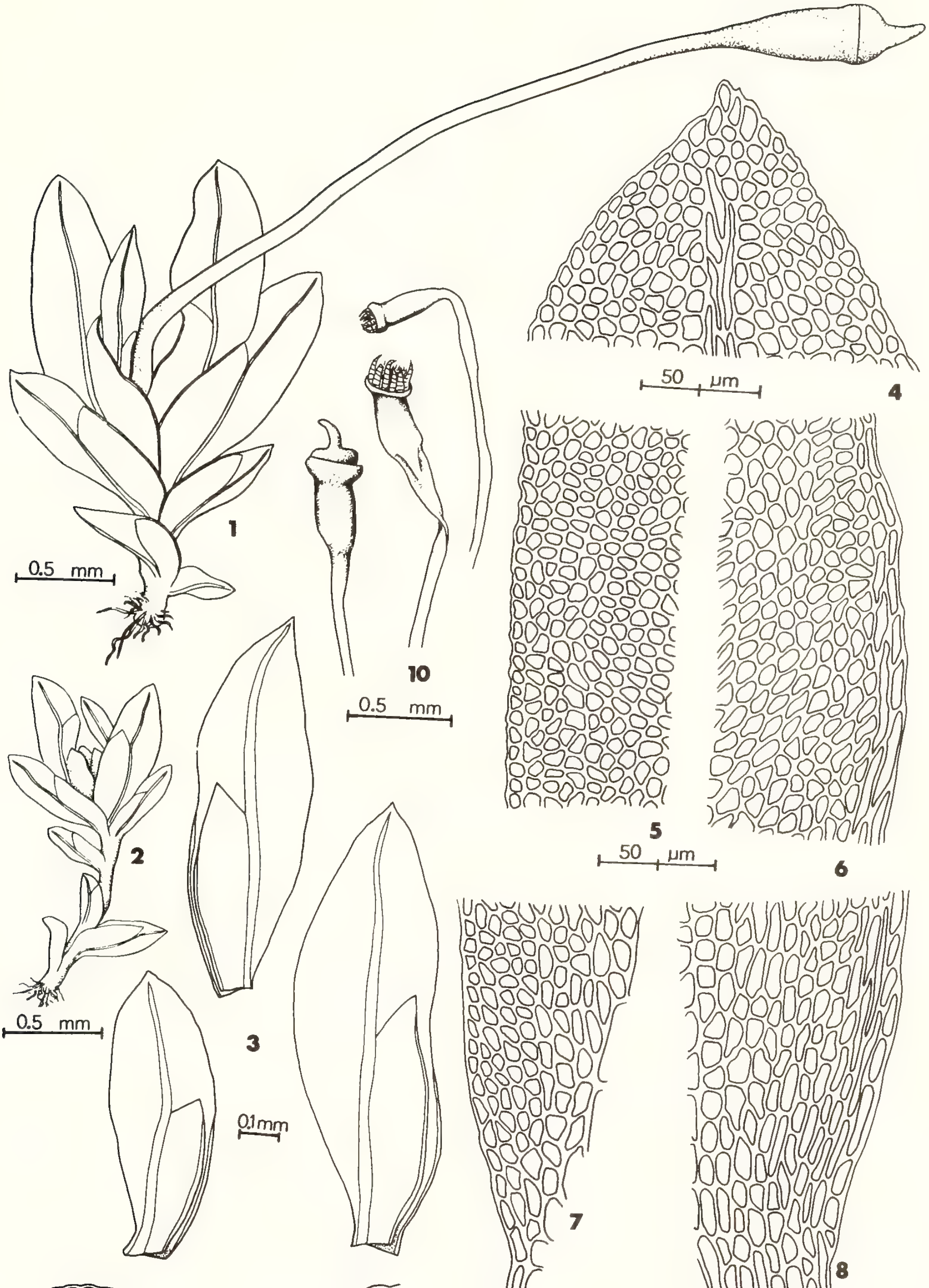

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Plate 53. *Fissidens exiguus*. 1. Habit. 2. Male plant. 3. Leaves. 4–8. Leaf cells (4, apical. 5, median-marginal of dorsal lamina. 6, median-marginal of vaginant lamina. 7, alar of dorsal lamina. 8, alar of vaginant lamina.). 9. Cross-section of marginal cells above vaginant lamina. 10. Capsules (dry).

Family SCHISTOSTEGACEAE

Schistostega Mohr, Observ. Bot. 26. 1803.

Habit: Plants erect to prostrate, gregarious to loosely tufted.

Colour: Bluish-green, becoming yellowish brown with age.

Stems: 2–7 mm high, dimorphous: sterile plants frondiform, naked below, rhizoids at base, fertile plants with 5-ranked leaves at apex, female plants frondiform below, rhizoids at base. Protonema persistent, extensive, cells light-reflecting and appearing to emit a yellowish glow.

Leaves: Sterile plants leaves distichous, complanate, lanceolate, acute, decurrent, the bases confluent, flat, somewhat contorted when dry, lamina unistratose. Fertile plants leaves 5-ranked, linear-lanceolate, acute, clustered at apex, female plants with lower leaves similar to those of sterile plants.

Leaf Margins: Plane, entire, indistinctly bordered with narrow, elongate cells.

Costae: Lacking.

Leaf Cells: Smooth, the walls of medium thickness, lacking pits. Median cells oblong-rhomboidal, becoming wider near base.

Asexual Reproductive Bodies: Present as obclavate, smooth, 3–4 celled gemmae, tapering to a distal acumen, produced on protonema.

Sex: Autoicous. Male and female organs on separate plants but apparently produced from the same protonema.

Calyptrae: Conic-mitrate, naked, fugacious.

Capsules: Solitary, on a seta arising from stem apex, reddish brown, subglobose to ovoid, erect, smooth.

Setae: Straight, smooth, usually not twisted when dry, green to yellowish green.

Annuli: Lacking.

Opercula: Plane-convex.

Peristomes: Lacking.

Spores: Yellow to greenish yellow, globose, smooth, 9–14 μm.

1. **Schistostega pennata** (Hedw.) Web & Mohr, Ind. Mus. Pl. Crypt. 2. 1803.
Gymnostomum pennatum Hedw., Spec. Musc. 31. 1801.
[Synonym: *S. osmundacea* Mohr]
PLATE 54

Protonema persistent, extensive, the cells light-reflecting, emitting a golden-green glow; stems 2–7 mm high, dimorphous: sterile plants frodiform, the leaves distichous, complanate, lanceolate, acute, decurrent, the bases confluent, fertile plants with 5-ranked, linear-lanceolate leaves tufted at apex, female plants with lower leaves similar to those of sterile plants, all leaves ecostate; autoicous, capsules solitary, subglobose to ovoid, erect, smooth, exserted on a long seta, peristome lacking.

Habitat: On earth in caves, often associated with sandstone or limestone, but also in dark recesses and soil pockets on steep banks around roots of trees.

Maritime Distribution: Rare. New Brunswick (King's, Restigouche, Sunbury, York); Nova Scotia (Victoria).

Range: Extremely sporadic, occurring in *Newfoundland, New Brunswick, Nova Scotia, Quebec, Ontario, British Columbia, Alberta, New Hampshire, *Rhode Island, New York, Michigan, Wisconsin, and Washington. Europe, Asia.

Chromosome Number: n = 11, 14.

Remarks: Commonly known as the "Luminous Moss", sometimes as "Goblin Gold" or "Cave Moss" because of the glowing golden-green nature of the plant's protonema and its common occurrence in caves.

Schistostega is often described as dioicous but the plants are apparently autoicous since both male and female organs are produced on separate stems from the same protonema.

Protonematal gemmae, which have been reported in *Schistostega* (Edwards, 1978), were not seen on the Maritime plants.

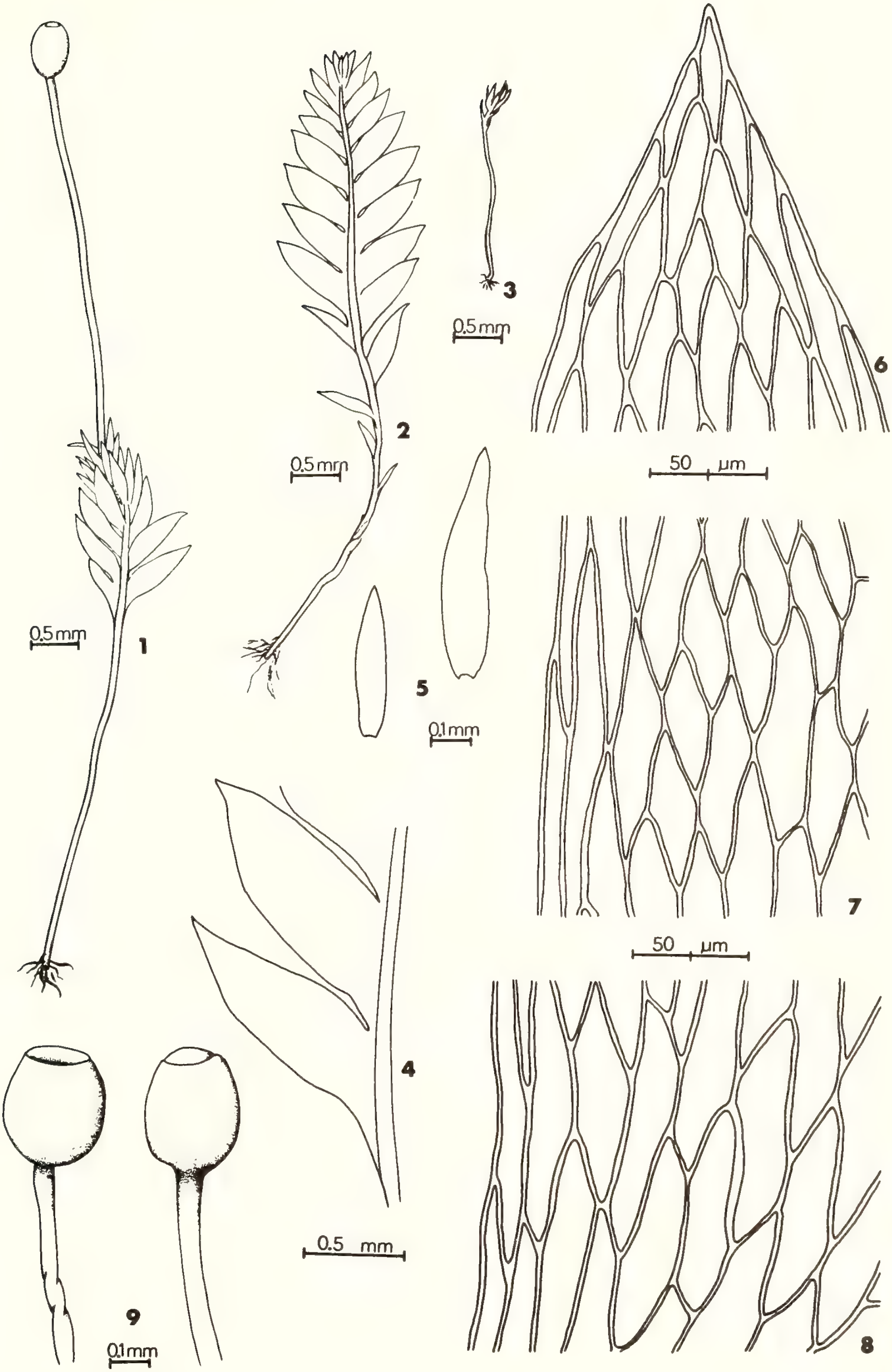
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Plate 54. *Schistostega pennata*. 1. Habit of fruiting plant. 2. Habit of sterile plant. 3. Male plant. 4. Portion of stem of sterile plant. 5. Leaves of upper part of fruiting plant. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, basal.). 9. Capsules (dry).

Family DITRICHACEAE

1. Stems appearing flattened; leaves distichous .... 6. *Distichium* (p. 131)
1. Stems not flattened; leaves in more than 2 rows 2
    2. Plants small, 2–6 mm high; capsules immersed; peristome lacking .... 1. *Pleuridium* (p. 114)
    2. Plants larger, often 1 cm high or more; capsules exserted; peristome present 3
        3. Plants bluish green and glaucous due to a granular or cottony substance on leaves and stems; capsules erect, straight, smooth when dry ..... 4. *Saelania* (p. 127)
        3. Plants not bluish green and glaucous; capsules erect to horizontal, straight or arcuate, smooth or sulcate when dry 4
            4. Leaves keeled above; median leaf cells quadrate to short-rectangular; capsules reddish to purple, horizontal, sulcate when dry; forks of peristome teeth usually connected at nodes below .... 5. *Ceratodon* (p. 129)
            4. Leaves subtubulose above; median leaf cells rectangular to oblong-elliptic; capsules yellow, brown or reddish brown, erect to inclined, smooth or slightly sulcate when dry; forks of peristome teeth not connected at nodes 5
                5. Leaves squarrose from a sheathing base; upper leaf cells prorate on dorsal surface .... 3. *Trichodon* (p. 125)
                5. Leaves erect-spreading to spreading; leaf cells smooth .... 2. *Ditrichum* (p. 117)

1. **Pleuridium** Rabenh., Deutschl. Krypt. Fl. 2(3): 79. 1848. *nom. cons.*

Habit: In erect, loose tufts.
Colour: Yellowish green, becoming brownish green with age.
Stems: 3–6 mm high, erect, simple or sometimes forked, rhizoids at base.
Leaves: Erect-spreading, straight or nearly so, subtubulose above, lamina unistratose, subulate with an ovate or oblong base, apex acute, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane or incurved above, entire or serrulate above from shoulders of broad base to apex.
Costae: Single, percurrent to excurrent, filling $^1/_3$ the base and all the apex.
Leaf Cells: Smooth, the walls of medium thickness, lacking pits. Median cells linear, often flexuose, becoming shorter and broader at base.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous or reported to be paroicous.
Calyptrae: Cucullate, naked, yellowish with a darker tip, extending to middle of capsule.
Capsules: Solitary, immersed, on a short seta arising from stem apex, light brown, ovoid to ellipsoidal, bluntly apiculate, smooth, opening by rupture of capsule wall.
Setae: Short, straight, smooth, not twisted, yellow.
Annuli: Lacking.
Opercula: Lacking.
Peristomes: Lacking.
Spores: Yellowish brown to orange, globose or nearly so, papillose, 24–35 μm in longest dimension.

1. **Pleuridium subulatum** (Hedw.) Rabenh., Deutschl. Krypt. Fl. 2(3): 79. 1848.
Phascum subulatum Hedw., Spec. Musc. 19. 1801.
[Synonyms: *P. acuminatum* Lindb.; *P. bolanderi* C. Müll. *ex* Jaeg. & Sauerb.]
PLATE 55

Small plants with short stems, up to 6 mm high, subulate leaves, up to 3 mm long, and immersed, ovoid to ellipsoidal capsules, without an operculum or peristome, that release the spores after rupture of the capsule wall.

Habitat: An ephemeral, often occurring in the spring, on soil, usually sandy, in open situations, especially roadsides, fields, pastures, and lawns.

Maritime Distribution: Rare, but probably more common than present collections indicate. New Brunswick (York); Nova Scotia (Annapolis, Hants, Kings).

Range: Southeastern Canada, from Nova Scotia to Ontario, south to Florida and Texas, in the west from southern British Columbia, south to California and *Arizona, east to Idaho. Europe, Asia, Africa.

Chromosome Number: n = 13, 26.

Remarks: *Pleuridium* is one of several genera of mosses that are known as the ''pygmy mosses''. These mosses are ephemeral and are colonizers of open, often weedy, habitats. Their small size and short-lived habit make them difficult plants to find.

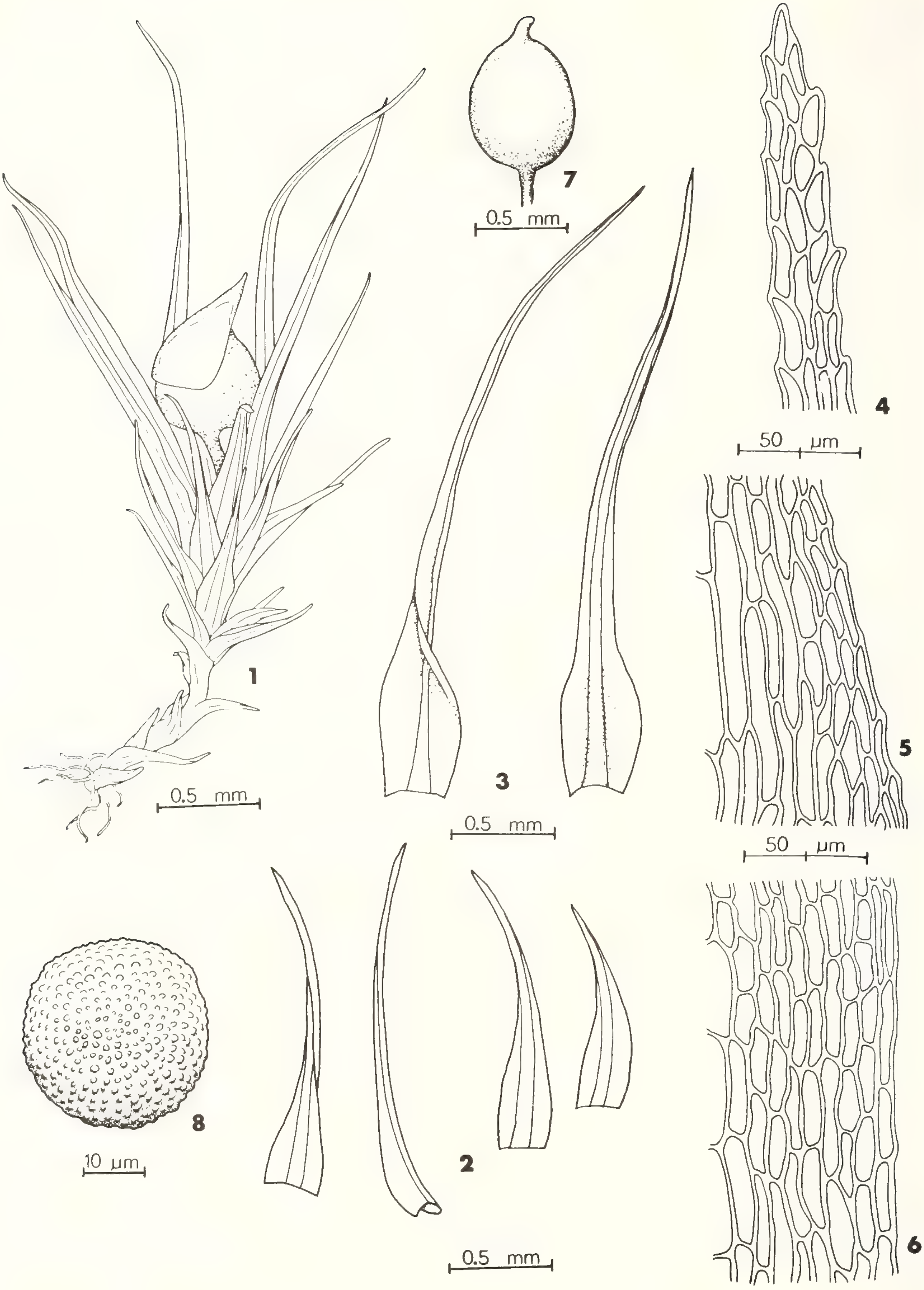
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Plate 55. *Pleuridium subulatum*. 1. Habit. 2. Leaves. 3. Perichaetial leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsule (dry). 8. Spore.

2. **Ditrichum** Hampe, Flora 50: 181. 1867. *nom. cons.*

Habit: In erect, loose tufts or occurring scattered.
Colour: Light green to yellowish green.
Stems: 0.3–5.0 cm high, rarely more, erect, simple or with few branches, rhizoids predominantly at base.
Leaves: Erect-spreading to spreading, straight or sometimes secund, tubulose, lamina unistratose, lanceolate-subulate, often narrowed to a filiform awn, acute to narrowly obtuse, nondecurrent. Perichaetial leaves undifferentiated or somewhat enlarged and clasping base of seta.
Leaf Margins: Plane, incurved or sometimes recurved, entire to serrate near apex.
Costae: Single, percurrent to excurrent, often occupying all the filiform awn, scarcely prominent on dorsal surface, smooth or toothed on dorsal surface near apex of leaf.
Leaf Cells: Smooth, thin-walled and lacking pits or thick-walled with pits in walls of basal cells. Median cells rectangular or oblong-elliptic.
Asexual Reproductive Bodies: Lacking or with yellow to orange, pyriform, ellipsoidal or irregularly shaped tubers on the rhizoids, 94–150 μm in longest dimension.
Sex: Autoicous or dioicous.
Calyptrae: Cucullate, naked, yellowish with reddish brown tip, fugacious.
Capsules: Solitary, on a seta arising from the stem apex, cylindric and erect or ovoid-cylindric and inclined, straight or slightly arcuate, weakly furrowed when dry and empty.
Setae: Straight to flexuose, smooth, occasionally twisted when dry, red to brown, sometimes yellow.
Annuli: 2–3 rows of large cells, deciduous.
Opercula: Conic to short-rostrate, straight or slightly curved.
Peristomes: Single, consisting of 16, reddish, papillose teeth, usually divided into 2 filiform segments to the short basal membrane, erect, straight to slightly twisted.
Spores: Yellowish, globose, smooth or papillose, 10–24 μm.

1. Plants often over 1 cm high; dioicous, seldom with sporophytes; occurring on soil over and in crevices of boulders and cliffs .... 1. *D. flexicaule*
1. Plants seldom reaching 1 cm high; autoicous of dioicous, frequently with sporophytes; occurring on soil along trails, roads, and in clearings 2
    2. Leaves short, 1–3 mm, often imbricate; plants dioicous; capsules erect, cylindric; setae red to brown when mature 3
        3. Leaves imbricate, apices obtuse, margins plane or nearly so; perichaetial leaves with abruptly narrowed apex shorter than sheathing base; tubers lacking on rhizoids .... 2. *D. lineare*
        3. Leaves not imbricate, apices acute, margins recurved; perichaetial leaves with narrowed apex equal to or longer than sheathing base; tubers present .... 3. *D. pusillum*
    2. Leaves long, 3–5 mm, spreading; plants autoicous; capsules erect to inclined, ovoid; setae yellow or red when mature 4
        4. Setae yellow; peristome teeth mostly less than 0.5 mm long; spores papillose, 16–25 μm .... 4. *D. pallidum*
        4. Setae orange to red; peristome teeth long, more than 0.5 mm long, often up to 1 mm; spores reticulate, 10–14 μm .... 5. *D. rhynchostegium*

1. Ditrichum flexicaule (Schwaegr.) Hampe, Flora 50: 182. 1867.

Cynodontium flexicaule Schwaegr., Spec. Musc. Suppl. 1(1): 113. 1811.

[Synonym: *Trichostomum flexicaule* (Schwaegr.) B.S.G.]

PLATE 56

Best distinguished from the other species by the usually long stems, up to 5 cm, and the thick-walled leaf cells with rounded ends. The plants are always sterile in the Maritimes.

Habitat: A calcareous species occurring on rock or soil over rock, especially on bluffs, cliff shelves or in crevices of cliffs.

Maritime Distribution: Frequent. New Brunswick (Victoria); Nova Scotia (Inverness, Kings, Victoria).

Range: Common in arctic North America, south to Washington, Idaho, Colorado, Iowa, Minnesota, Michigan, *Vermont, and Nova Scotia. Also in Greenland, Europe, Central and South America, *Asia, *Africa, *New Zealand.

Chromosome Number: Unreported.

Remarks: This species, the largest of the Maritime Ditricha, is a remarkably variable plant in regard to leaf size and form. Most of the Maritime plants are large, with well-developed, flexuose leaves, 4–6 mm long, and a long-excurrent costa. Plants with these characters have been named var. *sterile* De Not. or even given separate status as a species, *D. giganteum* Williams. A less common type of plant in the Maritimes is what has been named var. *densum* (B.S.G.) Braithw. which is a smaller plant, with poorly developed, nonflexuose leaves, 1–3 mm long, and a short-excurrent costa (Figs. 5–6). A comprehensive study of *D. flexicaule* is needed over its entire range to clarify the status of these forms in order to determine if either of them deserves taxonomic recognition.

2. **Ditrichum lineare** (Sw.) Lindb., Act. Soc. Sci. Fenn. 10: 108. 1871.
Didymodon linearis Sw., Adnot. Bot. 100. 1829.
[Synonyms: *Ditrichum vaginans* (Sull.) Hampe; *Trichostomum vaginans* Sull.]
PLATE 57

Easy to confuse with *D. pusillum* but differing primarily by the imbricate, obtuse leaves with plane margins, the perichaetial leaves that have a short, abruptly narrowed apex in comparison to the sheathing base, and the lack of tubers on the rhizoids.

Habitat: Frequently on clay, sand or gravelly soil banks in wooded clearings, along trails, roads or in other often disturbed environments.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Madawaska, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Labrador to Ontario, south to Missouri, Indiana, Tennessee, and Florida. *Europe.

Chromosome Number: n = 13 + 1.

3. **Ditrichum pusillum** (Hedw.) Hampe, Flora 50: 182. 1867.
Didymodon pusillus Hedw., Spec. Musc. 104. 1801.
[Synonym: *Ditrichum tortile* (Schrad.) Brockm.]
PLATE 58

Very close to *D. lineare* from which it is distinguished by the spreading leaves with recurved margins, the perichaetial leaves that have a long, abruptly narrowed apex in comparison to the base, and the presence of asexual reproductive bodies that are sometimes on the rhizoids. The asexual reproductive bodies are pyriform, ellipsoidal or irregularly shaped tubers, yellow to orange, 94-150 μm in longest dimension.

Habitat: On clay, sand or gravelly soil banks, especially in disturbed habitats, such as along roads and trails in the woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, Madawaska, Queen's, Victoria, Westmorland); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Pictou, Richmond, Victoria); Prince Edward Island (Queens).

Range: Labrador to Ontario, disjunct to *Alaska and British Columbia, south to Louisiana, Tennessee, and Florida. Europe, *Asia, *Africa.

Chromosome Number: n = 13, 13 + 1.

Remarks: Whitehouse (1976) was apparently the first to report the tubers on the rhizoids of *D. pusillum*.

4. **Ditrichum pallidum** (Hedw.) Hampe, Flora 50: 182. 1867.
Trichostomum pallidum Hedw., Spec. Musc. 108. 1801.
PLATE 59

Morphologically close to *D. rhynchostegium* but differing by the long median-marginal leaf cells, yellow setae, shorter and less twisted peristome teeth, 0.4–0.6 mm long, and large, papillose spores, 16–25 μm.

Habitat: On sandy or clay soil along roadsides, in fields or clearings in woods.

Maritime Distribution: Rare or seldom collected. New Brunswick (York); Nova Scotia (Annapolis, Halifax, Hants, Lunenburg).

Range: Southern Nova Scotia and New Brunswick, west in Canada to Ontario, west in the United States to Kansas, south to Texas, Louisiana and Florida. Europe, Asia, *Africa.

Chromosome Number: n = 13, 26.

Remarks: Anderson and Bryan (1958) clarified the specific differences between *D. pallidum* and *D. rhynchostegium* (as *D. henryi*) in a study of the autoicous species of *Ditrichum*.

5. **Ditrichum rhynchostegium** Kindb., Rev. Bryol. 37: 14. 1910.
[Synonym: *D. henryi* Crum & Anders.]
PLATE 60

Somewhat similar to *D. pallidum* but differing by the short median-marginal leaf cells, orange to reddish setae, long, twisted peristome teeth, 0.6–1.0 mm long, and small, reticulate spores, 10–14 μm.

Habitat: On sandy or clay soil in clearings in woods.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Queens); Prince Edward Island (Queens).

Range: Endemic to eastern North America where its range is poorly known. Known outside the Maritimes from Pennsylvania, District of Columbia, North Carolina, Arkansas, *Ohio, *Tennessee, *South Carolina, *Georgia, and *Louisiana.

Chromosome Number: n = 13.

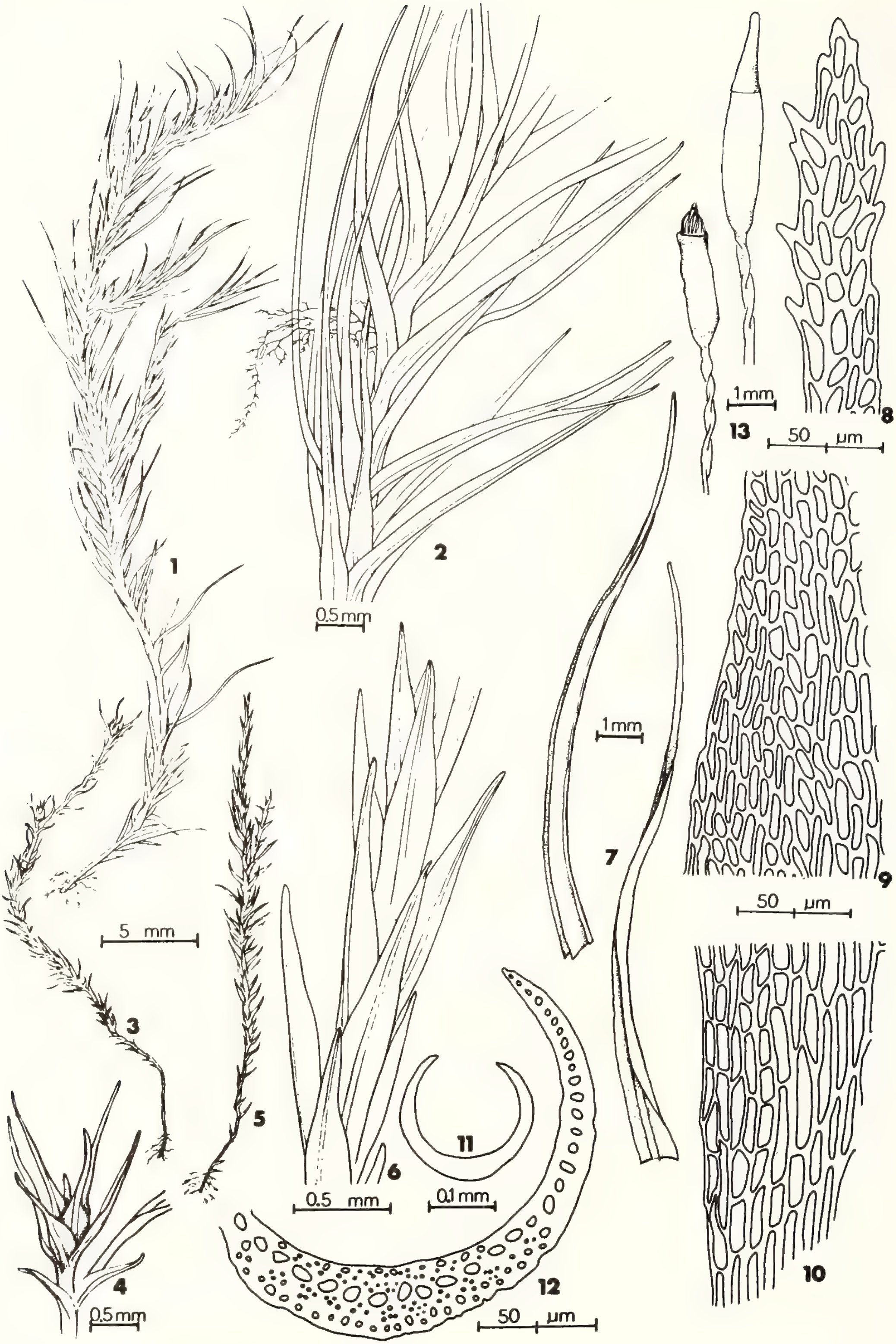
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Plate 56. *Ditrichum flexicaule*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Portion of stem with perigonial bud. 5. Habit of var. *densum*. 6. Portion of stem of var. *densum*. 7. Leaves. 8–10. Leaf cells (8, apical. 9, median-marginal. 10, alar.). 11–12. Cross-sections of leaves near base. 13. Capsules (dry).

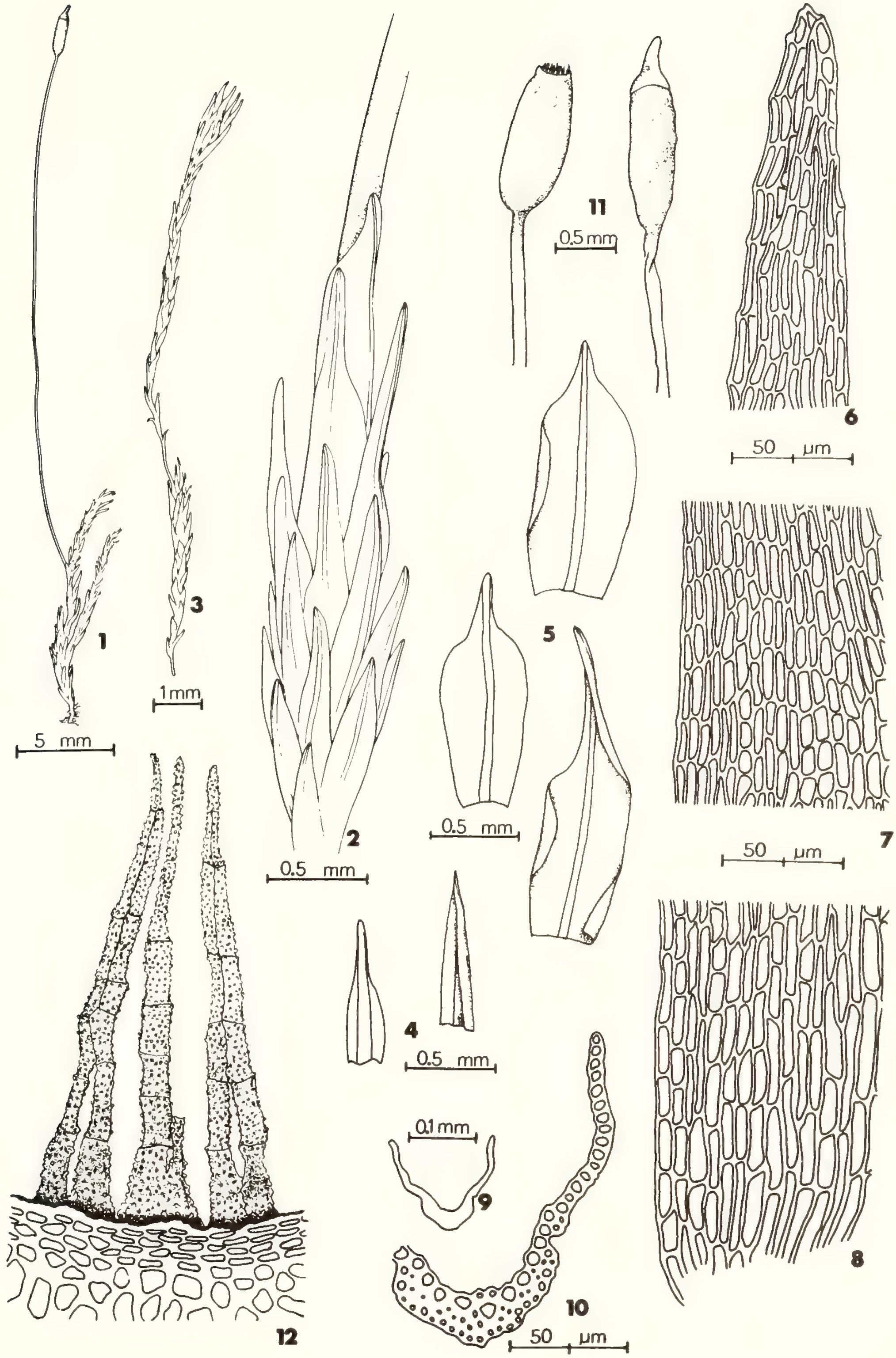
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Plate 57. *Ditrichum lineare*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Perichaetial leaves (inner). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9–10. Cross-sections of leaves near base. 11. Capsules (dry). 12. Peristome teeth.

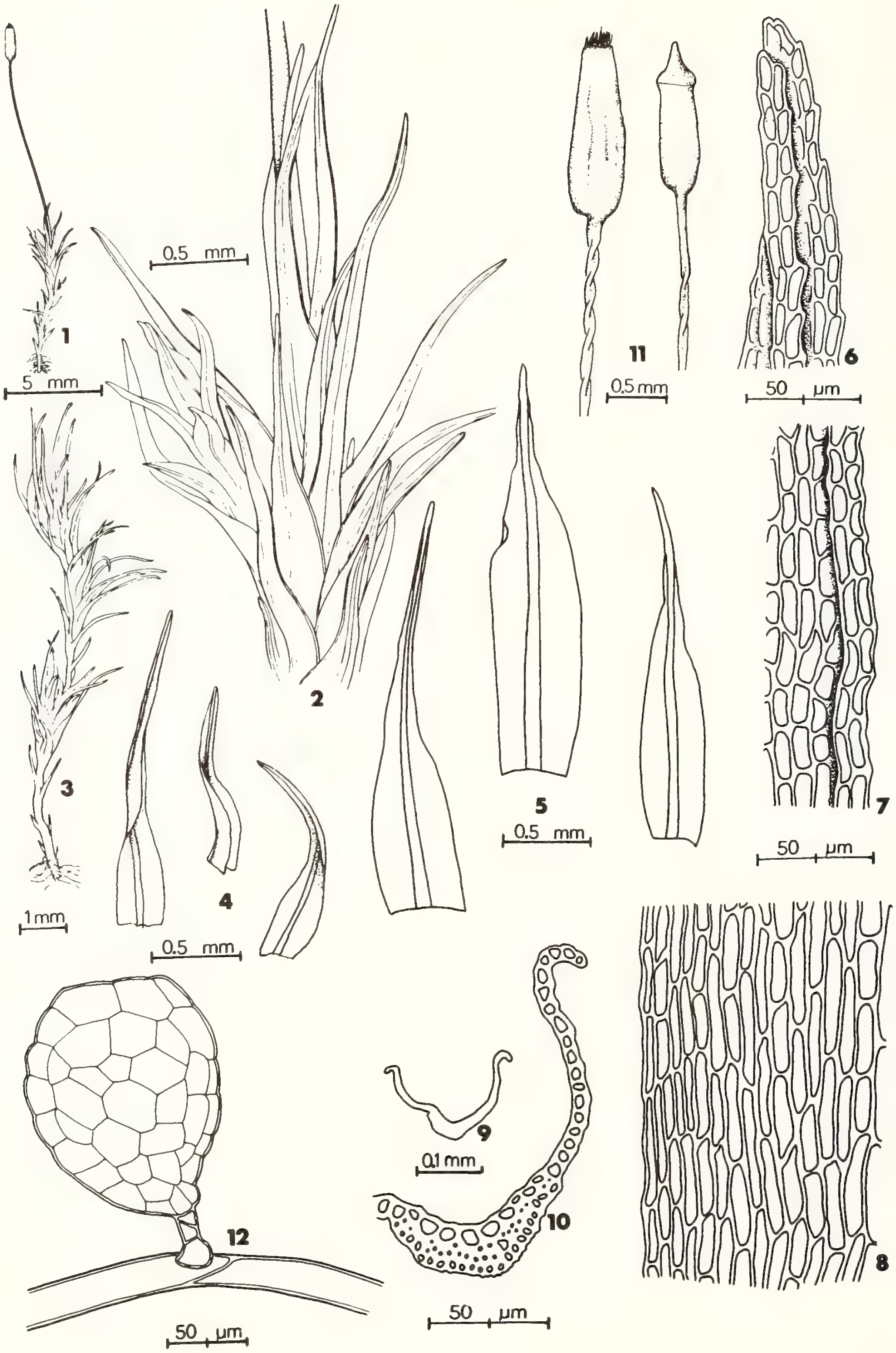
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Plate 58. *Ditrichum pusillum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Perichaetial leaves (inner). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9–10. Cross-sections of leaves near middle. 11. Capsules (dry). 12. Rhizoidal gemma.

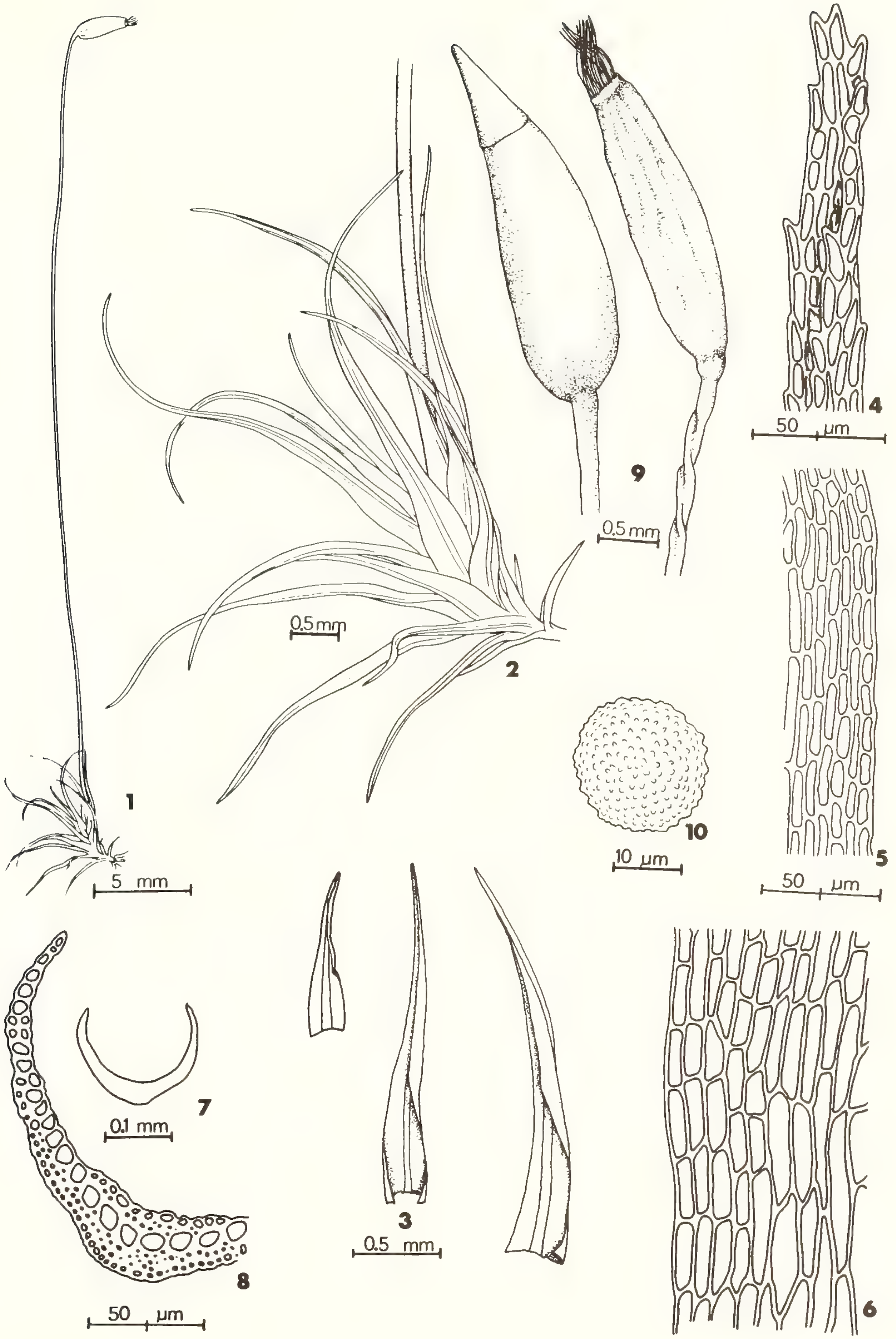
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Plate 59. *Ditrichum pallidum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7–8. Cross-sections of leaves near base. 9. Capsules, operculate (wet), inoperculate (dry). 10. Spore.

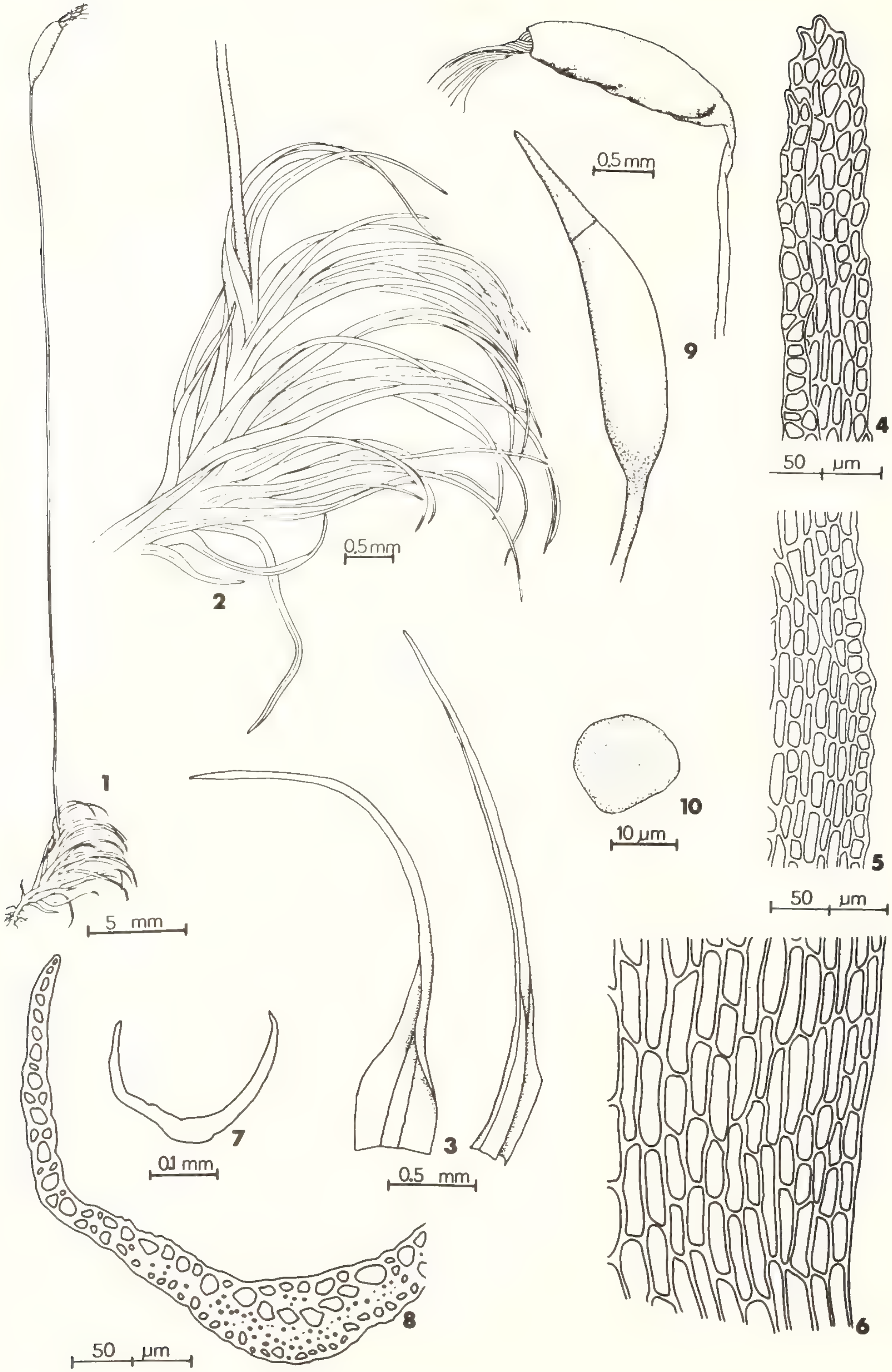
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Plate 60. *Ditrichum rhynchostegium*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7–8. Cross-sections of leaves near middle. 9. Capsules, operculate (wet), inoperculate (dry). 10. Spore.

3. **Trichodon** Schimp., Coroll. 36. 1856.

Habit: In gregarious colonies.
Colour: Light green to yellowish green.
Stems: Mostly 2–4 mm high, erect, simple, rhizoids at base.
Leaves: Squarrose, somewhat contorted when dry, tubulose, lamina unistratose below, sometimes bistratose above, the base broad, ovate and sheathing, abruptly narrowed above into a subula, acute, nondecurrent.
Leaf Margins: Plane or incurved, unistratose below, bistratose above, serrate to the enlarged region of the ovate base, entire below.
Costae: Single, percurrent, filling upper part of subula, occupying about $^1/_5$ of leaf base, strongly prorate on dorsal surface.
Leaf Cells: Smooth or prorate on dorsal surface, the walls of medium thickness, lacking pits. Median cells rectangular, sometimes quadrate and irregularly angled on margins, becoming longer near base.
Asexual Reproductive Bodies: Globose or irregularly shaped, yellowish brown tubers on rhizoids, 80–100 μm in longest dimension.
Sex: Dioicous. Perigonia and perichaetia terminal; male plants about the size of female plants.
Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.
Capsules: Solitary, on a seta arising from stem apex, light brown to reddish brown, narrowly cylindric, slightly arcuate or sometimes straight, erect to inclined, smooth.
Setae: Straight to flexuose, erect, smooth, twisted when dry, yellow to reddish brown.
Annuli: 1–3 rows of large cells, deciduous.
Opercula: Conic to short-rostrate, straight.
Peristomes: Single, consisting of 16, dark red, papillose teeth, divided nearly to the base to form 2 filiform segments, the tips all turning inward toward centre of capsule when dry.
Spores: Yellow to greenish yellow, globose, minutely papillose, 16–20 μm.

1. Trichodon cylindricus (Hedw.) Schimp., Coroll. 36. 1856.
Trichostomum cylindricum Hedw., Spec. Musc. 107. 1801.
[Synonyms: *Trichodon tenuifolius* Lindb.; *Ditrichum cylindricum* (Hedw.) Grout]
PLATE 61

Small plants, 2–4 mm high, with squarrose, subulate leaves, leaf cells strongly prorate on dorsal surface, and narrowly cylindric, erect to inclined, capsules that are slightly curved.

Habitat: On sandy soil in exposed situations, often in disturbed sites, along roadside banks, trails, fields, etc.

Maritime Distribution: Rare. New Brunswick (Westmorland). Collected only once, 19 km northwest of Salisbury, 23 July 1970 (*Ireland 13523*).

Range: Predominantly western and not uncommon from Alaska, south to Oregon. Also known in the west from the Yukon Territory, Idaho and Montana. Disjunct in eastern North America where it is known only from one locality in the Keweenaw Peninsula, Michigan, Quebec, Labrador, Newfoundland, and New Brunswick. Europe, *Japan.

Chromosome Number: n = 12, 13.

Remarks: Ireland (1978) studied the taxonomy and distribution of this species.

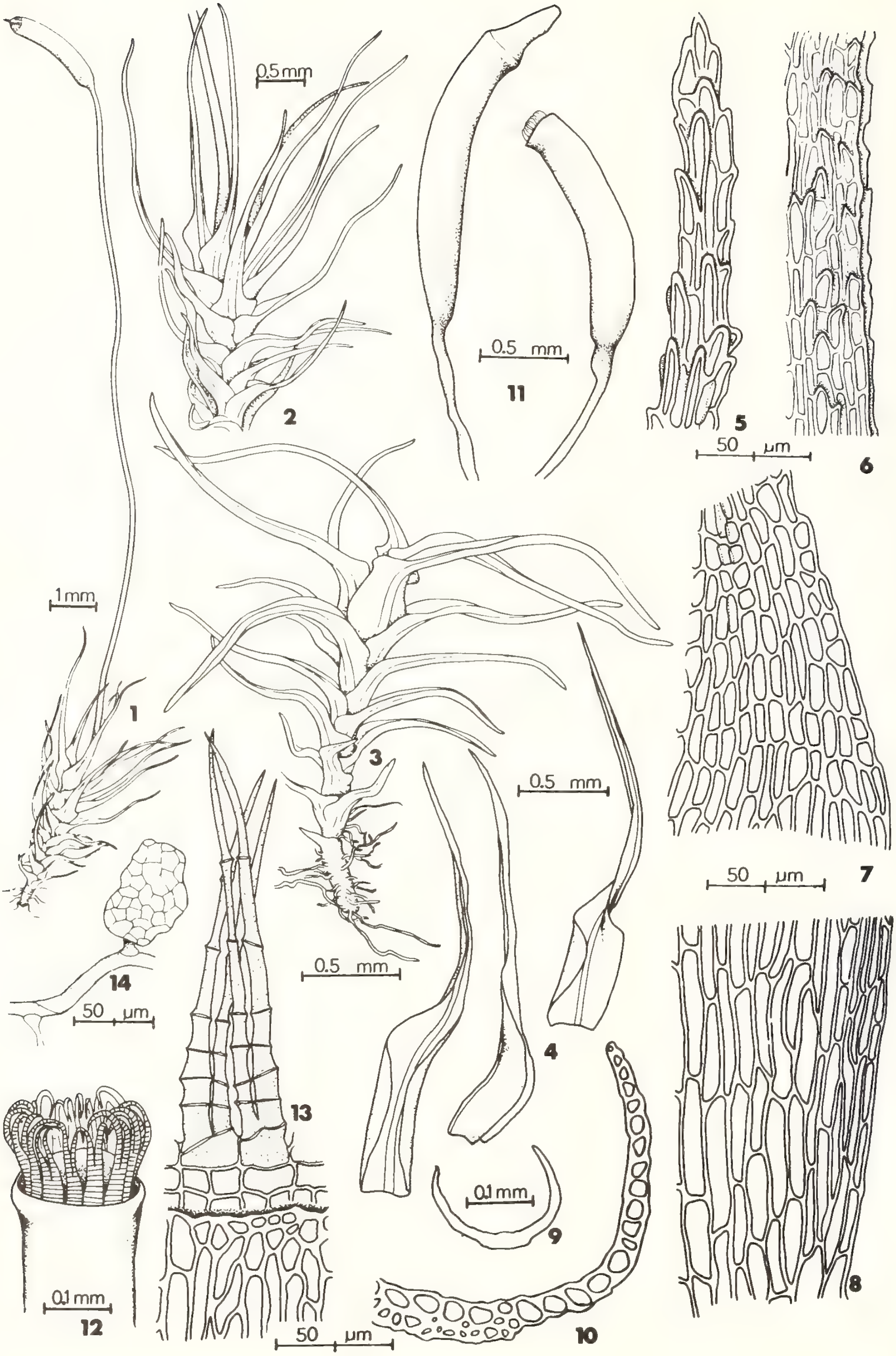
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Plate 61. *Trichodon cylindricus*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, upper (below apex). 7, median-marginal. 8, alar.). 9–10. Cross-sections of leaves near base. 11. Capsules (dry). 12. Peristome (dry). 13. Two peristome teeth. 14. Rhizoidal gemma.

4. **Saelania** Lindb., Utkast Nat. Grupp. Eur. Blandmoss. 35. 1878.

Habit: In erect, dense tufts or sods.

Colour: Light green to bluish green and glaucous due to a fine granular and cottony substance on some of the leaves and stems.

Stems: Up to 1.5 cm high, erect, red, simple or with a few branches, rhizoids at base.

Leaves: Erect to erect-spreading, slightly contorted when dry, keeled, lamina unistratose or bistratose in spots, especially on the margins, lanceolate, lower ones acute, upper and perichaetial gradually acuminate, nondecurrent.

Leaf Margins: Plane or narrowly recurved below, serrate to doubly serrate in upper half of leaf, entire below.

Costae: Single, percurrent to shortly excurrent, prominent on dorsal surface, the upper leaves with a few teeth on dorsal surface near apex.

Leaf Cells: Smooth or prorate above on dorsal surface, the walls of medium thickness, lacking pits. Median cells quadrate to short-rectangular, some irregularly angled, becoming longer near costa and base of leaf.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perigonia terminal on short, well-developed branches on stem below terminal perichaetia; leaves of sex buds longer than other leaves.

Calyptrae: Cucullate, naked, yellowish with brownish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellow to light brown, reddish at mouth, cylindric, straight, erect, irregularly wrinkled to smooth when dry.

Setae: Straight or nearly so, smooth, twisted when dry, yellowish to light brown, rarely reddish.

Annuli: 2–3 rows of large cells, persistent.

Opercula: Short- to long-rostrate, straight to arcuate.

Peristomes: Single, consisting of 16, dark red, strongly papillose teeth, divided nearly to the base to form 2 filiform segments, nodulose.

Spores: Greenish to yellow-brown, globose, minutely papillose, 16–20 μm.

1. **Saelania glaucescens** (Hedw.) Bom. & Broth., Herb. Mus. Fenn. 2: 53. 1894.
Trichostomum glaucescens Hedw., Spec. Musc. 112. 1801.
[Synonyms: *Leptotrichum glaucescens* (Hedw.) Hampe; *Ditrichum glaucescens* (Hedw.) Hampe; *Saelania caesia* (P. Beauv.) Lindb.]
PLATE 62

An easily recognized species because of the glaucous nature of the gametophyte. The glaucous appearance is due to a whitish granular or cottony substance present on the leaves and stems.

Habitat: On soil on steep banks or bluffs that are often sheltered.

Maritime Distribution: Rare. New Brunswick (Restigouche); Nova Scotia (Victoria).

Range: Alaska to Greenland, south to British Columbia, Arizona, Colorado, Iowa, Minnesota, Michigan, and New York. Europe, Asia, *Africa, New Zealand, *Pacific Islands.

Chromosome Number: n = 13.

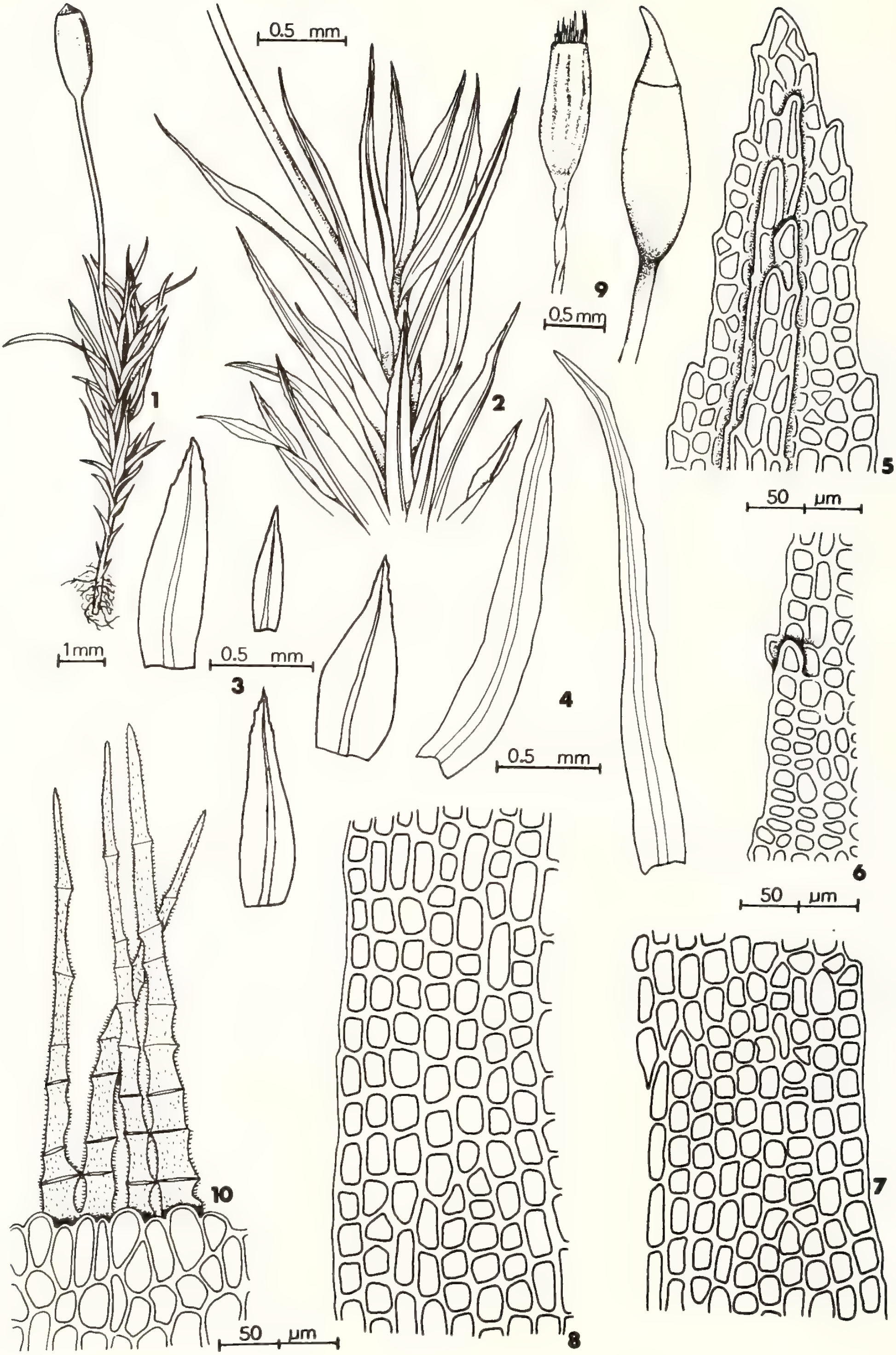
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Plate 62. *Saelania glaucescens*. 1. Habit. 2. Portion of stem. 3. Leaves (lower). 4. Leaves (upper). 5–8. Leaf cells (5, apical. 6, marginal. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

5. **Ceratodon** Brid., Bryol. Univ. 1: 480. 1826.

Habit: In erect, loose to dense tufts.

Colour: Usually dark green, often with a reddish or purplish tinge, especially when old.

Stems: 1.0–2.5 cm high, erect, mostly simple but sometimes with a few branches, rhizoids at base.

Leaves: Erect-spreading to spreading, straight or often slightly contorted when dry, keeled, lamina unistratose, lanceolate to ovate-lanceolate, acute to shortly acuminate, nondecurrent. Perichaetial leaves differentiated, sheathing base of seta.

Leaf Margins: Recurved nearly to apex, serrate above, entire below.

Costae: Single, percurrent to excurrent, rarely ending before the apex, prominent on dorsal surface of leaf, often reddish.

Leaf Cells: Smooth, the walls of medium thickness, lacking pits. Median cells quadrate to short-rectangular, sometimes irregularly angled or rounded, becoming longer near apex and base of leaves.

Asexual Reproductive Bodies: Lacking on plants from the Maritime Provinces. Cylindrical, multicellular propagules with thin walls known to occur rarely on the stems of plants from elsewhere.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from the stem apex, dark red to reddish brown or purplish, becoming pale with age, oblong-ovoid to oblong-cylindric, somewhat arcuate, inclined to horizontal, deeply furrowed and with a constricted neck that appears strumose when dry.

Setae: Straight or nearly so, smooth, twisted when dry, reddish to purplish.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: High-conic, straight.

Peristomes: Single, consisting of 16, dark red, papillose teeth, divided nearly to the base to form 2 filiform segments with pale borders, the segments often united at the nodes, the tips all turning inward toward centre of capsule when dry.

Spores: Yellow to greenish yellow, globose, smooth or minutely papillose, 10–14 μm.

1. Ceratodon purpureus (Hedw.) Brid., Bryol. Univ. 1: 480. 1826.

Dicranum purpureum Hedw., Spec. Musc. 136. 1801.

PLATE 63

The lanceolate to ovate-lanceolate, keeled leaves with margins recurved nearly to apex, the reddish excurrent costae and the reddish to purplish sporophytes with deeply furrowed urns are distinctive.

Habitat: An extremely weedy species often found in every type of disturbed habitat on soil, rock, wood and humus.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Richmond, Victoria, Yarmouth, Sable Island, St. Paul Island); Prince Edward Island (Kings, Prince, Queens).

Range: Cosmopolitan. Widespread throughout Canada, where it is known from every province and territory, and in the United States, where it probably occurs in every state. Very likely occurring in every country throughout the world but possibly replaced by closely related taxa in tropical latitudes.

Chromosome Number: n = 13.

Remarks: This is an extremely common species which is often troublesome to identify because of its variability. Many subspecies, varieties and forms have been described but few of them are based on characters which correlate. One variety of questionable value is var. *conicus* (Hampe *ex* C. Müll.) Husn., which was collected by Erskine (1950) in Nova Scotia. A worldwide monograph of *Ceratodon* would be of immense help in sorting out any subspecific taxa worth recognition.

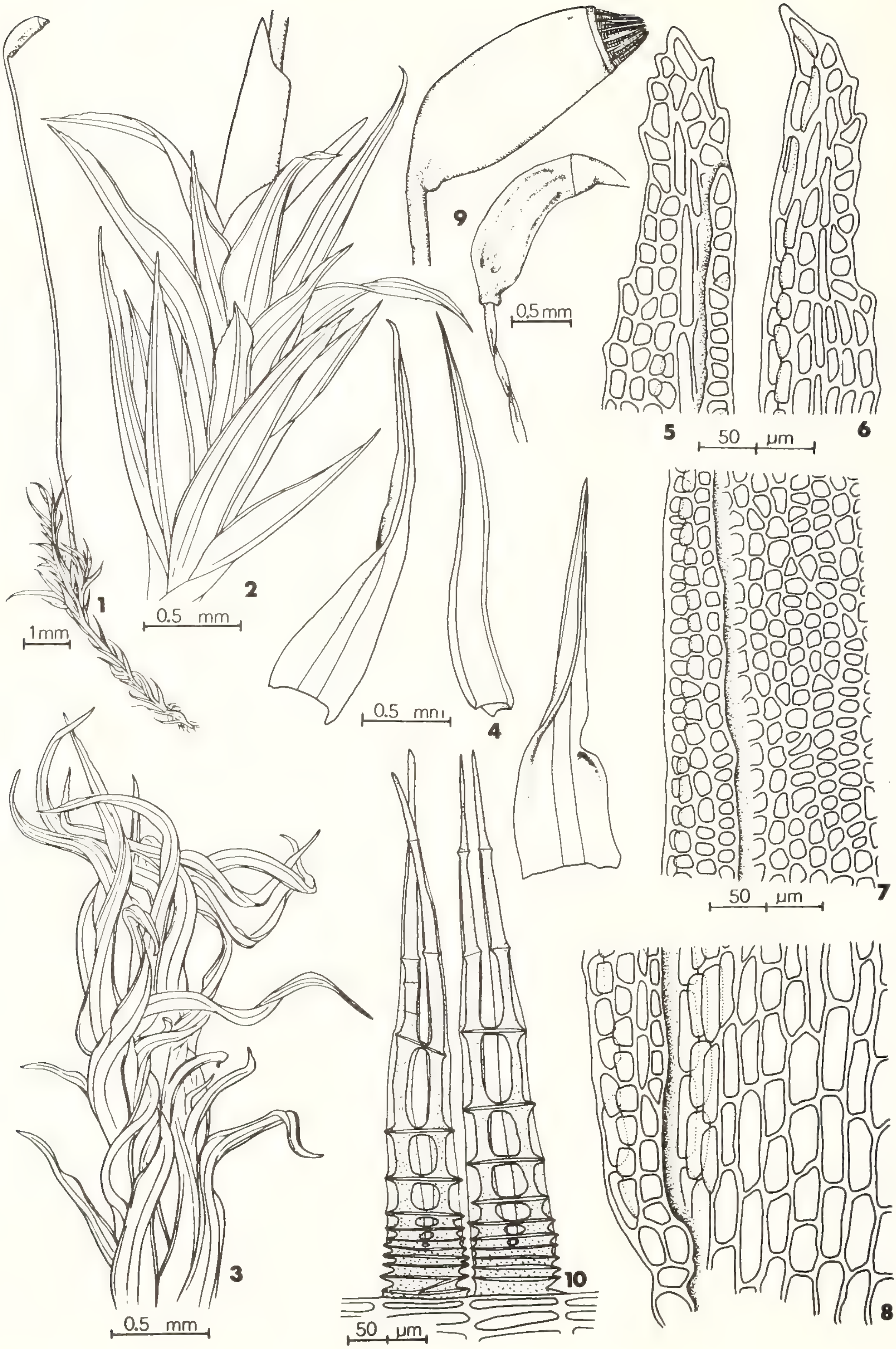
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Plate 63. *Ceratodon purpureus*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–8. Leaf cells (5–6, apical. 7, median-marginal. 8, alar.). 9. Capsules, operculate (dry), inoperculate (wet). 10. Peristome teeth.

6. **Distichium** B.S.G., Bryol. Eur. 2: 153. 1846 (fasc. 29–30 Mon. 1). *nom. cons.*

Habit: In erect, dense, tomentose tufts.

Colour: Yellowish-green to dark green with reddish brown tomentum below.

Stems: 1–6 cm high, erect, simple or with a few branches, with a flattened appearance, rhizoids starting near middle of stem and extending to base.

Leaves: Distichous, base oblong, sheathing stem and portion of leaf above, abruptly narrowed to a linear, concave, spreading to almost squarrose, rough subula, lamina unistratose, apex acute, nondecurrent. Perichaetial leaves not differentiated.

Leaf Margins: Plane or somewhat incurved, entire below, serrulate to serrate in subula region, especially near apex.

Costae: Single, excurrent, usually filling subula, covering $^1/_4$–$^1/_3$ of oblong base, roughened on dorsal surface in subula region.

Leaf Cells: Smooth below, prorate above on dorsal surface in subula region, walls of medium thickness, lacking pits. Cells of oblong base linear, linear-flexuose or rectangular, upper cells of subula quadrate to short-rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown, cylindric to ovoid-cylindric, straight to slightly arcuate, erect and symmetric or inclined and asymmetric, somewhat wrinkled when dry.

Setae: Straight or somewhat flexuose, smooth, twisted when dry, yellowish brown to red or reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic, straight.

Peristomes: Single, consisting of 16, dark red, smooth to papillose or striolate, lanceolate teeth, divided nearly to base to form 2, rarely 3 segments.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 19–47 μm in longest dimension.

1. Capsule cylindric, erect; spores 19–24 μm .... 1. *D. capillaceum*
1. Capsule ovoid, horizontal; spores 30–47 μm .... 2. *D. inclinatum*

1. Distichium capillaceum (Hedw.) B.S.G., Bryol. Eur. 2: 156. 193. 1846 (fasc. 29–30 Mon. 4.1).
Cynodontium capillaceum Hedw., Spec. Musc. 57. 1801.
[Synonym: *Swartzia montana* Lindb.]
PLATE 64

The linear, spreading, distichous leaves, with shiny, white, oblong, clasping bases are the best means of recognizing this plant on sight. Distinguished from *D. inclinatum* by the longer stems, up to 6 cm, with less crowded leaves and the cylindric, erect, symmetric capsules with smaller spores, 19–24 μm in longest dimension.

Habitat: Mainly on calcareous rock, primarily in cliff crevices, sometimes on soil or humus over rock.

Maritime Distribution: Common in suitable sites. New Brunswick (Albert, Kent, Restigouche, Victoria); Nova Scotia (Inverness, Kings, Victoria).

Range: Alaska to Greenland, south to California, Arizona, New Mexico, South Dakota, Iowa, Michigan, Vermont, and New Hampshire. Central and South America, Europe, Asia, *Africa, Australia, New Zealand, Pacific Islands.

Chromosome Number: n = 14, 28, 42.

2. Distichium inclinatum (Hedw.) B.S.G., Bryol. Eur. 2: 157. 194. 1846 (fasc. 29–30 Mon 5.2).
Cynodontium inclinatum Hedw., Spec. Musc. 58. 1801.
[Synonym: *Swartzia inclinata* (Hedw.) P. Beauv.]
PLATE 65

Similar to *D. capillaceum* when sterile but the stems are shorter, up to 2.5 cm high, and the leaves are more crowded. The ovoid, inclined and asymmetric capsules with large spores, 30–47 μm in longest dimension, are the best means of distinguishing *D. inclinatum* from *D. capillaceum*.

Habitat: Occurring on calcareous rock, either in cliff crevices or soil over cliff ledges, along the coast.

Maritime Distribution: Rare. New Brunswick (Albert, Restigouche).

Range: Alaska to Greenland, south to Montana, Minnesota, and New Brunswick. Europe, *Asia, *Africa. In the United States, reported from northern California, Wyoming, Nevada, Utah, Colorado, and New England.

Chromosome Number: n = 13, 14.

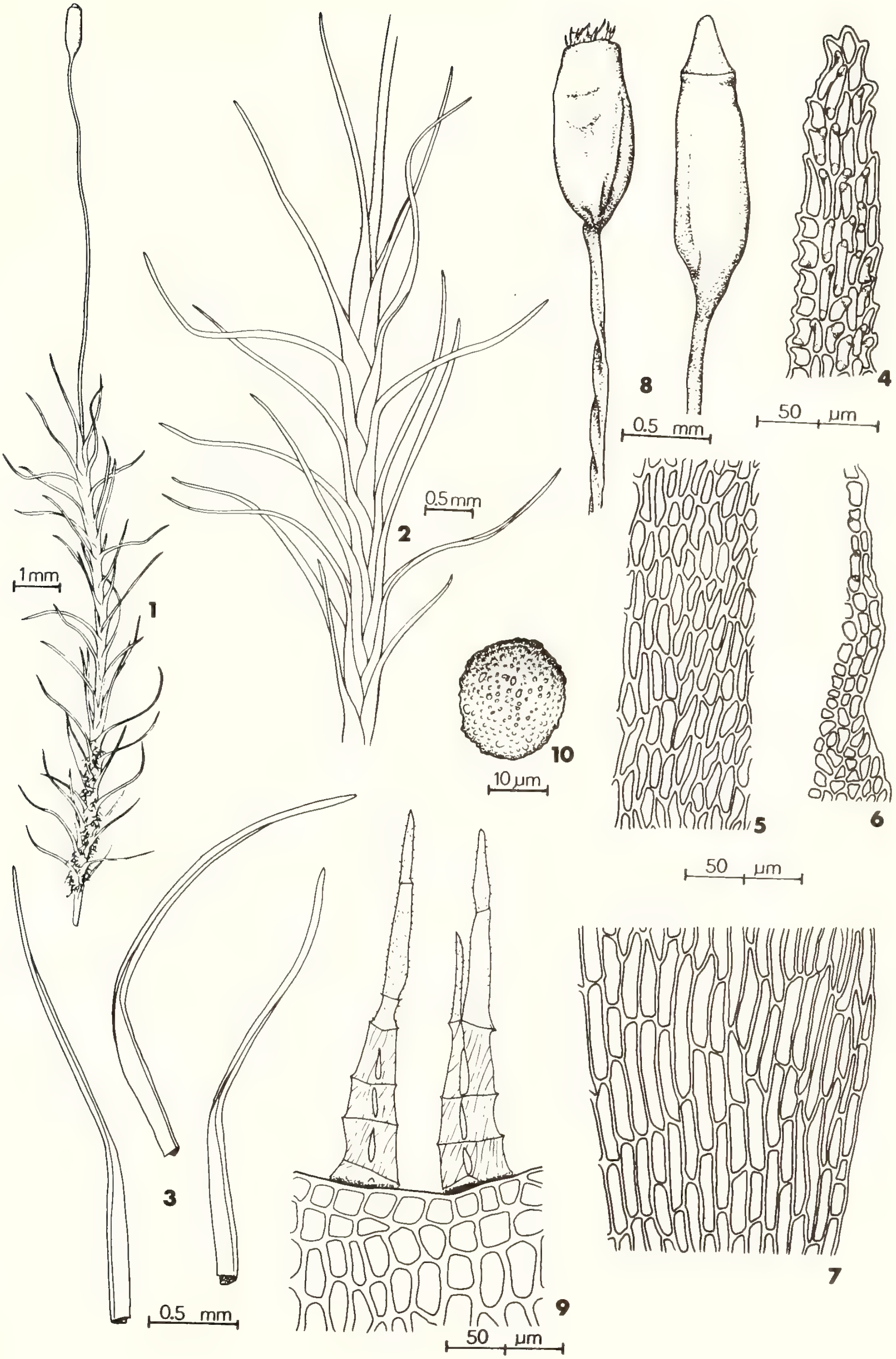
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Plate 64. *Distichium capillaceum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal (at shoulder). 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome teeth. 10. Spore.

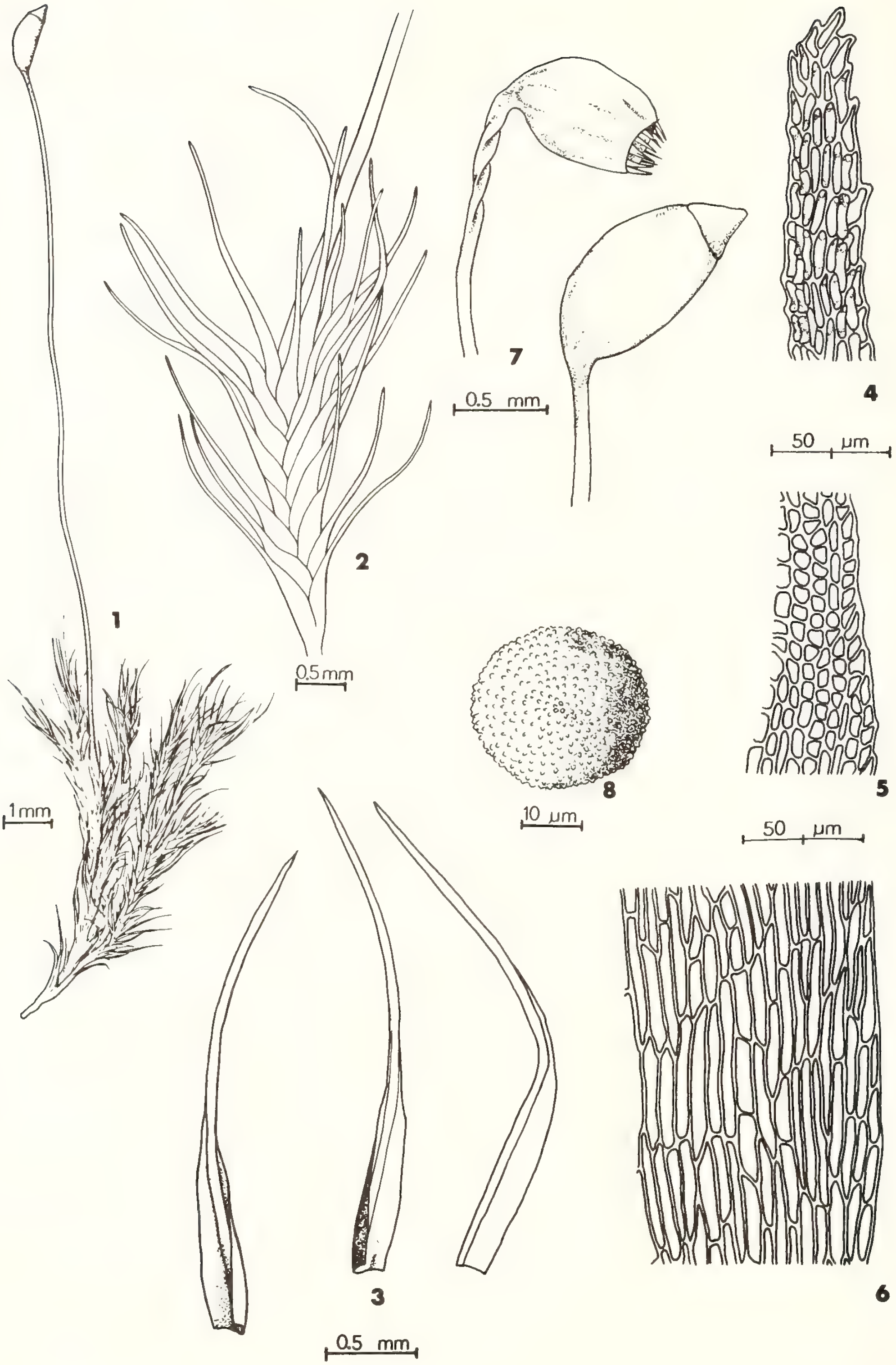
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Plate 65. *Distichium inclinatum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules, operculate (wet), inoperculate (dry), 8. Spore.

Family SELIGERIACEAE

1. Plants extremely small, stems seldom reaching 4 mm high; autoicous; alar cells not inflated ..... 1. *Seligeria* (p. 135)
1. Plants relatively large, stems mostly 4 mm high or more; dioicous; alar cells inflated ..... 2. *Blindia* (p. 139)

1. **Seligeria** B.S.G., Bryol. Eur. 2: 7. 1846 (fasc. 33–36 Mon. 1).

Habit: Plants minute, in loose to dense gregarious colonies.
Colour: Dark green to yellowish green, brown below.
Stems: 1–2 mm high, erect, simple, sometimes forked, rhizoids at base.
Leaves: Erect to erect-spreading, straight, sometimes curved when dry, concave to nearly flat, lamina unistratose, lanceolate, linear, or subulate, acute to obtuse, nondecurrent. Perichaetial leaves scarcely differentiated, somewhat broader at base.
Leaf Margins: Plane, entire or minutely serrulate.
Costae: Single, ending just below apex to excurrent, smooth or prorate on dorsal surface.
Leaf Cells: Smooth or prorate on dorsal surface, thin- or thick-walled, lacking pits. Median cells rounded, quadrate, irregularly angled, or rectangular, becoming longer near base.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous. Perigonia at base of plant just below perichaetium.
Calyptrae: Cucullate, naked, yellowish with a darker tip, falling early.
Capsules: Solitary, on a seta arising from stem apex, brown, cylindric, ovoid or somewhat pyriform, straight, erect to horizontal, smooth or somewhat wrinkled, sometimes contracted at neck when dry.
Setae: Straight or arcuate, smooth, twisted when dry, yellowish to brown.
Annuli: Lacking.
Opercula: Rostrate, straight to somewhat curved.
Peristomes: Single, consisting of 16, reddish, lanceolate, smooth undivided teeth.
Spores: Yellow to yellowish green, globose to ovoid, minutely papillose, 9–15 μm in longest dimension.

Vitt (1976) has recently revised the North American species of *Seligeria*.

1. Leaves with acute apices 2
    2. Leaf margins serrulate to base or nearly so; costae subpercurrent to percurrent, not filling apices; setae straight when wet ..... 1. *S. brevifolia*
    2. Leaf margins entire; costae excurrent, filling apices; setae arcuate when wet ..... 2. *S. recurvata* (in part)
1. Leaves with obtuse apices 3
    3. Leaf apices broadly obtuse; setae straight when wet ..... 4. *S. diversifolia*
    3. Leaf apices narrowly obtuse; setae arcuate when wet 4
        4. Costae subpercurrent to percurrent, not filling apices ..... 3. *S. campylopoda*
        4. Costae excurrent, filling apices ..... 2. *S. recurvata* (in part)

1. Seligeria brevifolia (Lindb.) Lindb., K. Svenske Vet. Ak. Handl. 23(10): 84. 1890.
S. pusilla var. *brevifolia* Lindb., Oefv. K. Vet. Ak. Foerh. 21: 188. 1864.
PLATE 66

Plants with leaf apices acute, margins serrulate to base or nearly so, costae ending below apices to percurrent and capsules with straight setae.

Habitat: On calcareous rock, often shaded and in humid environments.

Maritime Distribution: Rare. New Brunswick (Restigouche). Known only from one locality, 2.4 km south of St. Jean-Baptiste-de-Restigouche *(Ireland 14513a)*.

Range: Poorly known in North America where it occurs only in New Brunswick and *Newfoundland. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: The plants of *Seligeria brevifolia* are a lighter green than the other Maritime species.

2. Seligeria recurvata (Hedw.) B.S.G., Bryol. Eur. 2: 12. 112. 1846 (fasc. 33-36 Mon. 6.3).

Grimmia recurvata Hedw., Spec. Musc. 75. 1801.

PLATE 66

Plants with acute leaves, leaf margins entire, costae excurrent, filling apices, and capsules with curved setae.

Habitat: On sandstone, especially on shaded boulders and bluffs along creeks.

Maritime Distribution: Rare. New Brunswick (Westmorland). Known from a single locality, 19 km northwest of Salisbury *(Ireland 13528, 13531)*.

Range: In western North America known from British Columbia and Washington and in the East from Newfoundland to Ontario, south to Tennessee, Ohio, and Missouri. Europe, *Asia.

Chromosome Number: n = 13, 14.

3. Seligeria campylopoda Kindb. *ex* Mac. & Kindb., Cat. Canad. Pl. 6: 41. 1892.

PLATE 67

Plants with acute to narrowly obtuse leaves, leaf margins usually serrulate at apices, costae percurrent or ending just below apices and capsules with curved setae.

Habitat: On calcareous rock, often shaded and nearly devoid of other bryophytes.

Maritime Distribution: Rare. New Brunswick (Restigouche, St. John, Victoria).

Range: In western North America from Alaska and the Yukon, south to Washington and Montana; in the East from Newfoundland to Ontario, south to Iowa, Michigan, and Pennsylvania. Known in the Canadian High Arctic from Bathurst Island. Europe.

Chromosome Number: Unreported.

4. Seligeria diversifolia Lindb., Oefv. K. Vet. Ak. Foerh. 18: 281. 1861.

PLATE 67

Plants with narrowly to broadly obtuse leaves, leaf margins usually serrulate at apices, rarely entire, costae ending just below apices and capsules with straight setae.

Habitat: On calcareous rock bluff, mostly devoid of other bryophytes.

Maritime Distribution: Rare. Known, thus far, only from New Brunswick (Restigouche) where it was collected beside railroad tracks, 1.6 km north of Kedgwick *(Ireland 14588)*.

Range: Known in North America from New Brunswick, Quebec and Alaska (Vitt, 1976). Europe, *Asia.

Chromosome Number: Unreported.

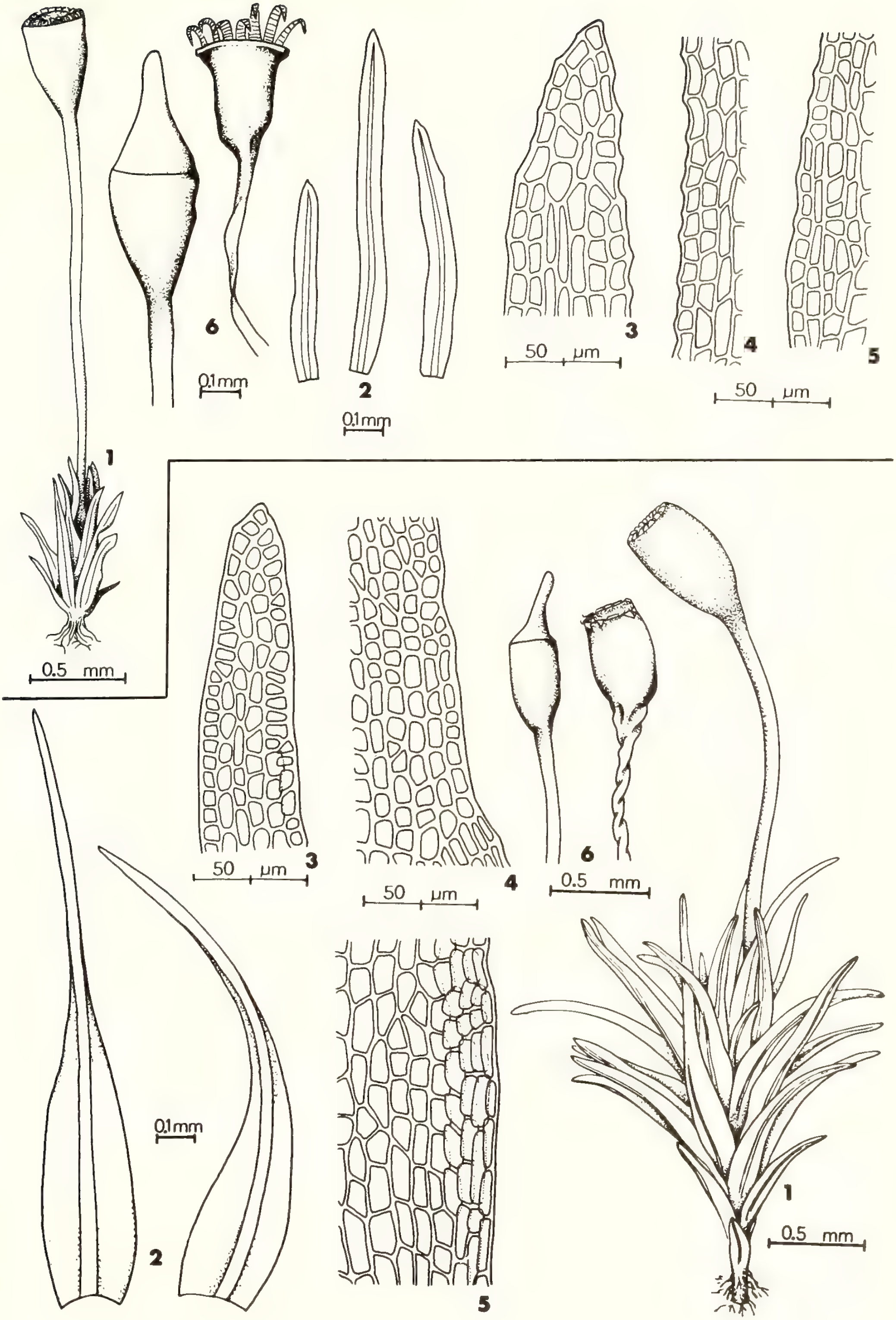
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Plate 66. *Seligeria brevifolia* (above), *Seligeria recurvata* (below). 1. Habit. 2. Leaves. 3–5. Leaf cells (3, apical. 4, median-marginal. 5, alar.). 6. Capsules, operculate (wet), inoperculate (dry).

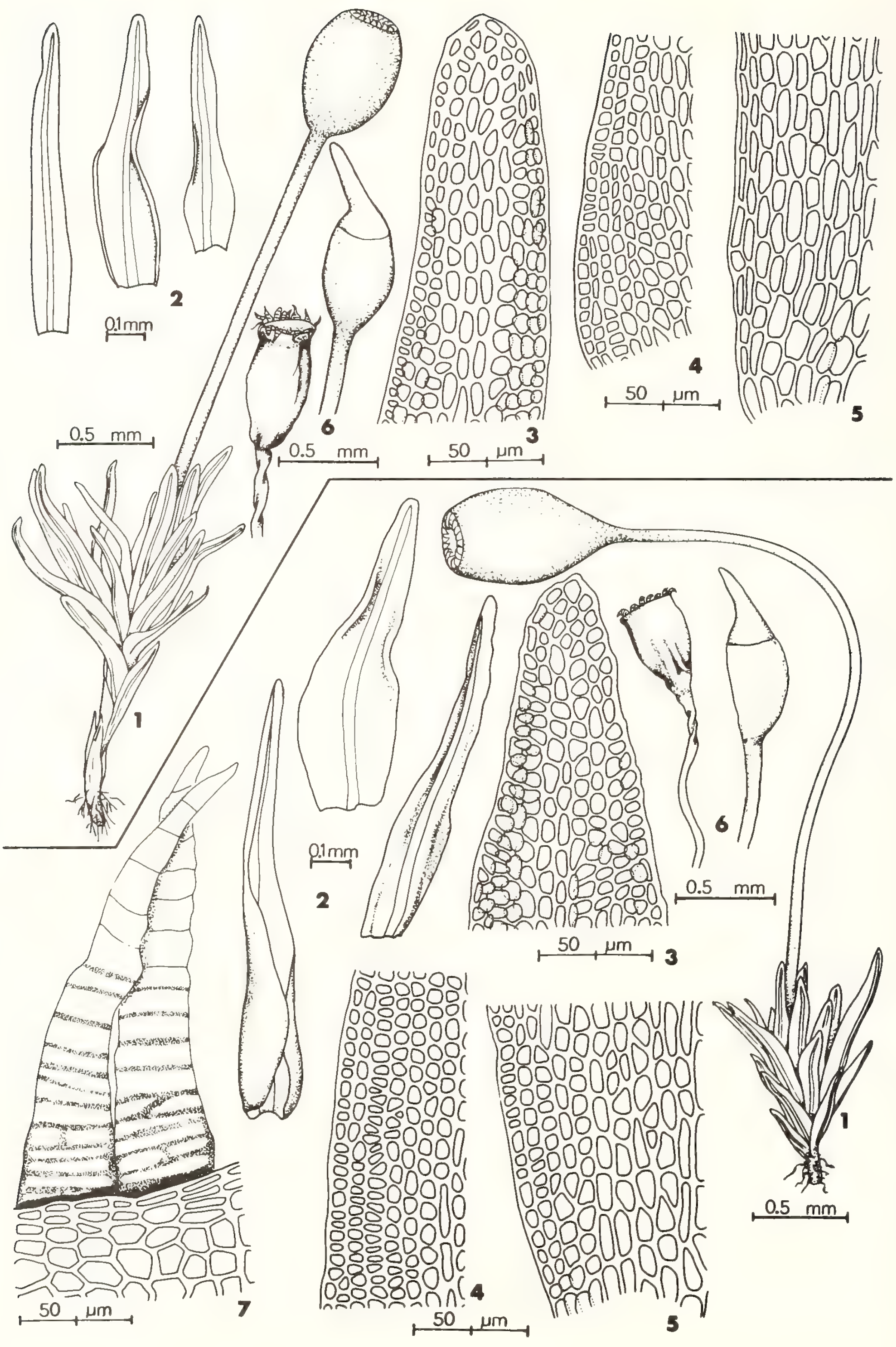
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Plate 67. *Seligeria diversifolia* (above), *Seligeria campylopoda* (below). 1. Habit. 2. Leaves. 3–5. Leaf cells (3, apical. 4, median-marginal. 5, alar.). 6. Capsules, operculate (wet), inoperculate (dry). 7. Peristome teeth.

2. **Blindia** B.S.G., Bryol. Eur. 2: 17. 1846 (fasc. 33–36 Mon. 1).

Habit: In erect, loose to dense tufts.

Colour: Dark green to yellowish green, brown to blackish below, glossy, stems red.

Stems: 1–5 cm high, erect, often branched, rhizoids usually scarce, sometimes a few at base.

Leaves: Erect-spreading, straight to somewhat curved, often falcate-secund at stem tips, scarcely changed when dry, concave, lamina unistratose, subulate with an oblong base, obtuse or sometimes acute, nondecurrent. Perichaetial leaves differentiated, clasping base of seta.

Leaf Margins: Incurved, entire or denticulate at apex, entire below.

Costae: Single, excurrent, filling the subula, covering $^1/_6$–$^1/_{10}$ of the leaf base.

Leaf Cells: Smooth, thick-walled except for the alar cells, lacking pits. Median cells linear, linear-flexuose or rectangular; alar cells reddish brown, abruptly inflated, extending to costa.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Perigonia and perichaetia terminal, branching by innovations to produce additional sex buds.

Calyptrae: Cucullate, naked, reddish from tip to middle, whitish or yellowish below, fugacious.

Capsules: Solitary, exserted, sometimes emergent, on a seta arising from stem apex, brown to reddish brown, pyriform, straight, erect, smooth, neck wrinkled when dry.

Setae: Straight or arcuate, smooth, twisted when dry, reddish.

Annuli: Lacking.

Opercula: Rostrate, curved.

Peristomes: Single, consisting of 16, dark red, lanceolate, smooth, undivided teeth, sometimes cribrose.

Spores: Yellow to yellowish green, globose or nearly so, indistinctly warty, 14–19 μm in longest dimension.

1. **Blindia acuta** (Hedw.) B.S.G., Bryol. Eur. 2: 19. 114. 1846. (fasc. 33–36 Mon. 3.1).
Weissia acuta Hedw., Spec. Musc. 71. 1801.
[Synonym: *B. acuta* var. *flexipes* Ren. & Card.]
PLATE 68

Medium-sized plants with red stems, up to 5 cm high, concave, subulate leaves with abruptly inflated, reddish brown alar cells, and pyriform capsules exserted on straight to arcuate setae.

Habitat: On wet boulders, cliff faces and ledges, frequently near waterfalls.

Maritime Distribution: Common in suitable sites. New Brunswick (Albert, Queen's, Victoria); Nova Scotia (Annapolis, Inverness, Kings, Victoria, St. Paul Island).

Range: Alaska to Greenland, south to California, Idaho, Montana, Colorado, Minnesota, Wisconsin, and Michigan; in the mountains to North Carolina and *South Carolina. Europe, *Central and *South America, *Asia, *Africa, *Australia.

Chromosome Number: n = 13, 14.

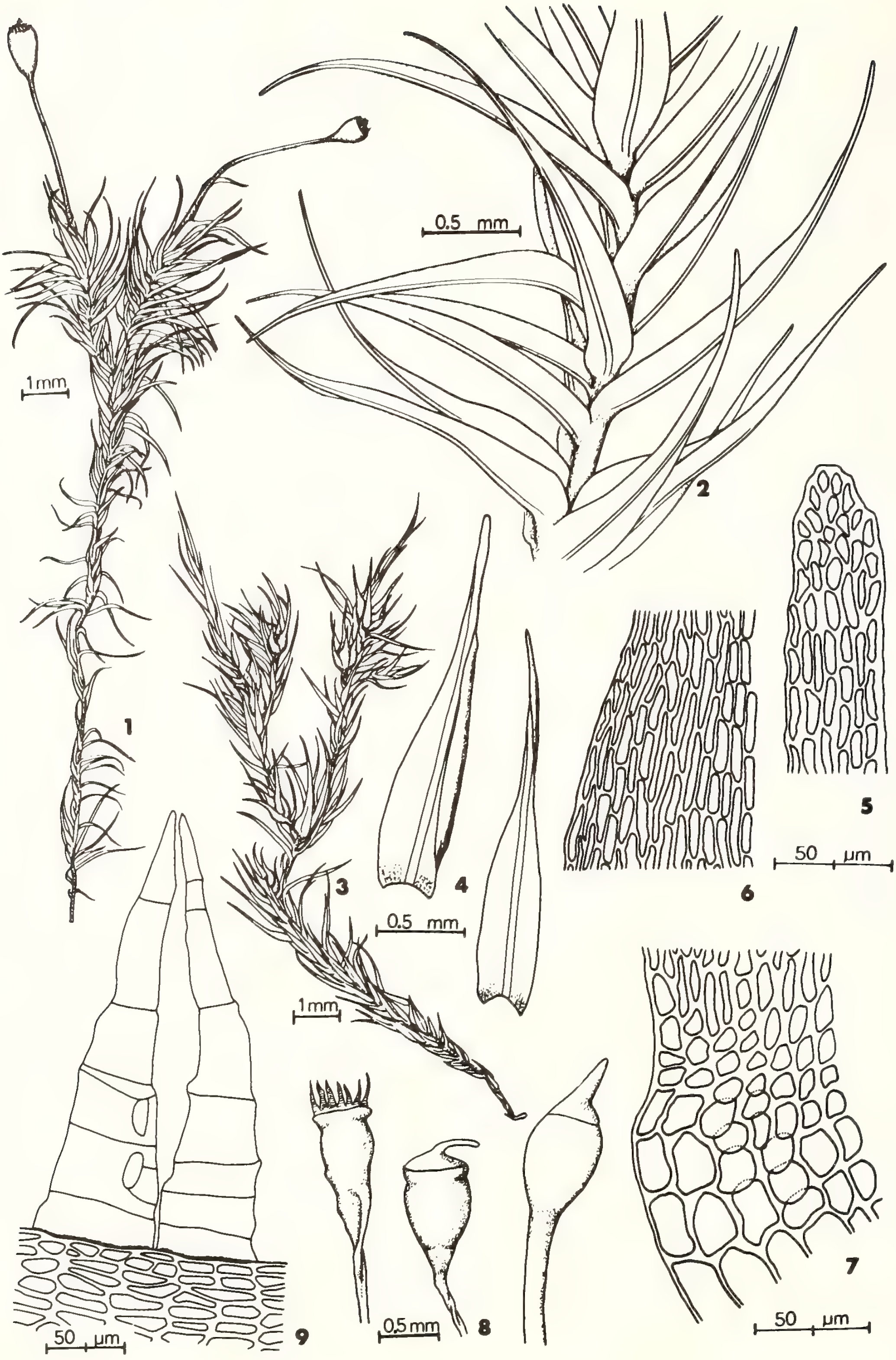
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Plate 68. *Blindia acuta*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (wet at right). 9. Peristome teeth.

Family DICRANACEAE

1. Alar cells differentiated, enlarged and inflated, often orange or brown 2

2. Leaves with margins entire or nearly so, cells with longitudinal cuticular ridges ...... 6. *Dicranoweisia* (in part) (p. 163)

2. Leaves with margins usually serrulate to serrate, sometimes entire, cells lacking longitudinal cuticular ridges 3

3. Costae with stereid cells, usually above and/or below guide cells ...... 9. *Dicranum* (p. 171)

3. Costae lacking stereid cells 4

4. Plants whitish- or grayish-green; costae broad, finely striate on dorsal surface, composed of a mixture of hyaline and chlorophyllose cells (seen in cross-section); dioicous; capsules erect, straight ...... 10. *Paraleucobryum* (p. 194)

4. Plants dark green to yellowish- or brownish-green; costae narrow, lacking striations on dorsal surface, composed only of hyaline cells (seen in cross-section); autoicous; capsules inclined, slightly arcuate ...... 8. *Kiaeria* (p. 167)

1. Alar cells undifferentiated 5

5. Leaf cells with longitudinal cuticular ridges ...... 6. *Dicranoweisia* (in part) (p. 163)

5. Leaf cells lacking longitudinal cuticular ridges 6

6. Neck of capsules as long or longer than urn ...... 1. *Trematodon* (p. 142)

6. Neck of capsules scarcely differentiated 7

7. Leaf cells mammillose on both surfaces; stems sometimes with small, yellowish, cylindrical to globose, stalked gemmae; dioicous ...... 5. *Dichodontium* (p. 161)

7. Leaf cells smooth or dorsally papillose; stems lacking gemmae; autoicous or dioicous 8

8. Peristome teeth undivided, filiform, smooth below, faintly papillose to obliquely striate above ...... 3. *Rhabdoweisia* (p. 156)

8. Peristome teeth divided, or if undivided, not filiform, vertically pitted-striolate below, papillose above 9

9. Leaves not strongly crisped when dry, margins unistratose; dioicous ...... 2. *Dicranella* (p. 144)

9. Leaves strongly crisped when dry, margins completely or partially bistratose; autoicous 10

10. Leaves abruptly narrowed from a broad sheathing base, margins plane or recurved only on sheathing base; capsules strongly strumose ...... 7. *Oncophorus* (p. 165)

10. Leaves gradually narrowed and lacking sheathing base, margins recurved to near apex; capsules not strumose or weakly strumose ...... 4. *Cynodontium* (p. 158)

1. **Trematodon** Michx., Fl. Bor. Am. 2: 289. 1803.

Habit: Erect, scattered or in gregarious tufts.

Colour: Light green to yellowish green, becoming brownish with age.

Stems: 0.5–1.0 cm high, erect, simple or forked, rhizoids at base.

Leaves: Erect-spreading, contorted when dry, concave, lamina unistratose, ovate to oblong at base, gradually to abruptly narrowed to a subula, obtuse to acute, nondecurrent. Perichaetial leaves scarcely differentiated, with a broader base.

Leaf Margins: Plane, entire to serrate near apex, entire below.

Costae: Single, ending just below apex to shortly excurrent, filling most of subula, with a single stereid band.

Leaf Cells: Smooth, the walls of medium thickness, basal cells thin-walled, lacking pits. Median cells quadrate to short-rectangular, sometimes irregularly angled, becoming larger at base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perichaetia terminal, perigonial buds at base of plant.

Calyptrae: Cucullate, naked, covering capsule to narrowed neck, yellowish with a reddish tip.

Capsules: Solitary, on a seta arising from stem apex, light brown, cylindric, arcuate, rarely straight, erect, contracted to a slender neck as long as urn or somewhat longer, strumose at base.

Setae: Straight to flexuose, smooth, somewhat twisted when dry, yellow.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Long-rostrate, arcuate.

Peristomes: Single, consisting of 16, red, perforate teeth, papillose above, vertically striate below, undivided or divided at tips which turn inward toward center of capsule when dry, basal membrane well-developed.

Spores: Yellow to greenish yellow, globose to somewhat reniform, warty, 23–33 μm in longest dimension.

1. **Trematodon ambiguus** (Hedw.) Hornsch., Flora 2: 88. 1819.
Dicranum ambiguum Hedw., Spec. Musc. 150. 1801.
[Synonym: *Trematodon acicularis* Kindb.]
PLATE 69

The cylindric capsule, which has a long, differentiated neck and is exserted on a long, bright yellow seta, is an obvious and discernible feature that is readily observed even in the field.

Habitat: On predominantly clay soil in open disturbed sites, especially roadside banks and ditches, clearings in woods, stream banks, and fields.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Victoria, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Inverness, Kings, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Labrador, south to New Hampshire and New York, westward to Michigan and Ontario; disjunct to southwestern British Columbia, Europe, *Asia.

Chromosome Number: n = 15.

Remarks: Commonly known as the "Long-Necked Moss" because of the long neck of the capsule.

I have been unable to confirm the presence of gemmae in *T. ambiguus* which were reported by Savich-Liubitskaia and Smirnova (1970).

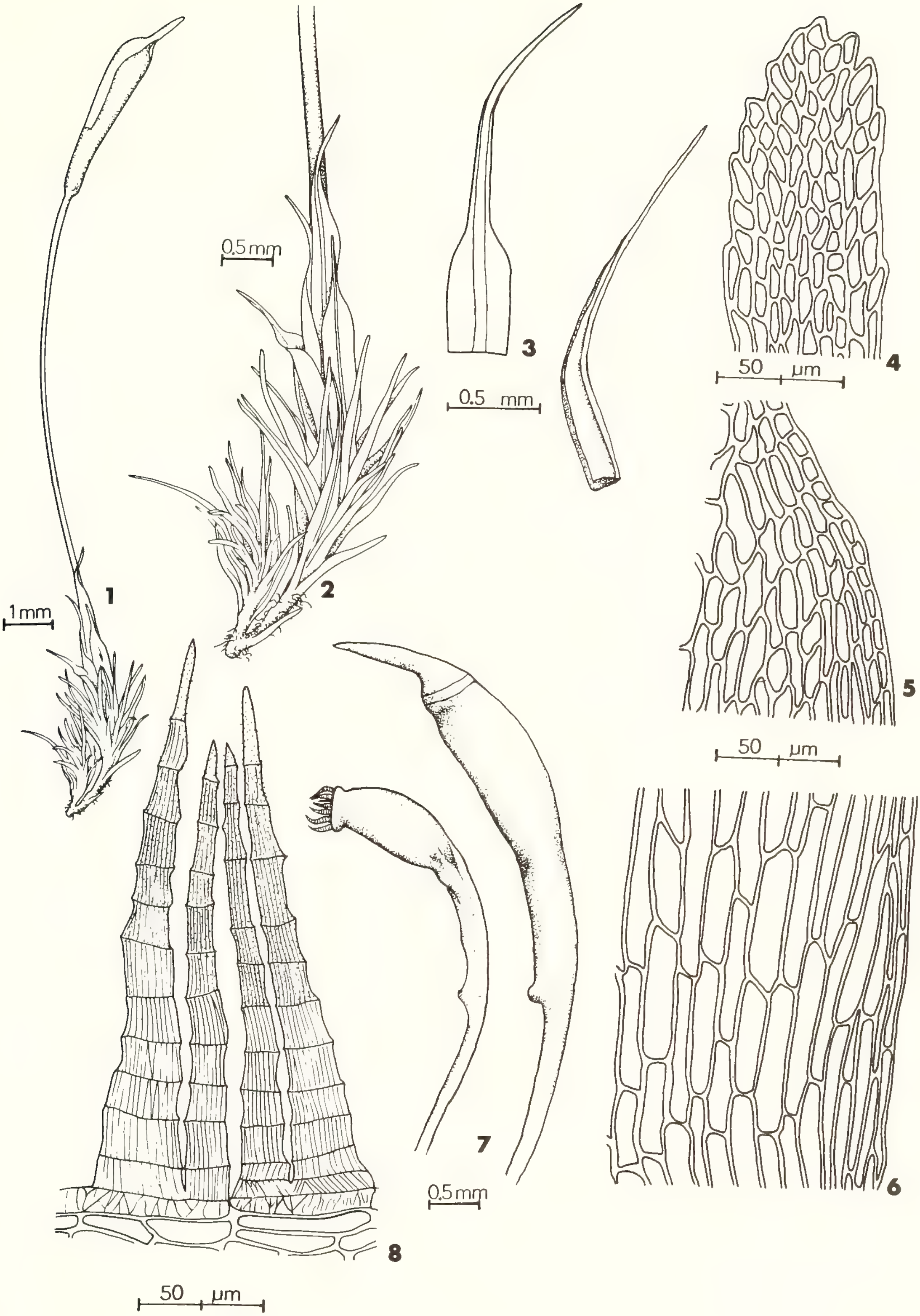
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Plate 69. *Trematodon ambiguus.* 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules, operculate (wet), inoperculate (dry). 8. Peristome teeth.

2. **Dicranella** (C. Müll.) Schimp., Coroll. 13. 1856.
Aongstroemia sect. *Dicranella* C. Müll., Syn. 1: 430. 1848.
[Synonym: *Anisothecium* Mitt.]

Habit: In erect, loose to dense tufts.

Colour: Green to yellowish green, often brown below, sometimes tinged with red.

Stems: 0.5–5.0 cm high, erect, simple or branching by innovations, rhizoids at base.

Leaves: Erect-spreading to squarrose, straight or falcate-secund, sometimes crisped or curled when dry, concave to keeled, sometimes nearly flat, lamina unistratose, rarely bistratose, usually lanceolate-subulate, acute, acuminate or obtuse, occasionally with an oblong, clasping base, narrowed to a lanceolate apex, nondecurrent to decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or recurved, serrulate to serrate above, sometimes entire, occasionally bistratose.

Costae: Single, ending below apex to excurrent, indistinct or dorsal surface of leaf, smooth or papillose to serrulate on dorsal surface near apex, with 1–2 stereid bands.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits. Median cells linear to rectangular, sometimes irregular in shape, alar cells not differentiated.

Asexual Reproductive Bodies: Lacking in *D. cerviculata* and *D. heteromalla* but other Maritime taxa with orange to reddish brown, globose or irregularly shaped tubers on the rhizoids, 90–250 μm in longest dimension.

Sex: Dioicous. Perichaetia and perigonia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, covering about half of capsule, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown to reddish brown, ovoid, oblong, or cylindric, straight or arcuate, erect to inclined, smooth, plicate or furrowed when dry, often contracted under mouth, sometimes strumose.

Setae: Straight or flexuose, smooth, usually twisted when dry, yellow or red, sometimes brown with age.

Annuli: Lacking or present, persistent and of 1 row of cells or deciduous and of 2 rows of cells.

Opercula: Long-rostrate to high-conic, often arcuate.

Peristomes: Single, consisting of 16, red teeth, divided about halfway into 2 segments, vertically pitted-striolate below, papillose above.

Spores: Yellow to greenish- or brownish-yellow, globose to ellipsoidal, smooth to minutely papillose, 14–21 μm in longest dimension.

1. Leaves squarrose from an enlarged, clasping base 2
  2. Leaves strongly decurrent, apex broad, often obtuse; costae occupying 1/15–1/20 of base .... 1. *D. palustris* (in part)
  2. Leaves not or weakly decurrent, apex narrow, usually acute; costae occupying 1/6–1/10 of leaf base 3
    3. Leaves entire to serrulate near apex; costae smooth; capsules ribbed or furrowed 4
      4. Leaves strongly squarrose; capsules slightly strumose .... 3. *D. grevilleana*
      4. Leaves weakly squarrose; capsules not strumose .... 6. *D. subulata* (in part)
    3. Leaves serrate to serrulate to middle; costae dorsally toothed; capsules smooth 5
      5. Leaves narrow, usually less than 0.5 mm wide, median cells 6–10 μm wide .... 2. *D. schreberiana*
      5. Leaves broad, 0.5 mm wide or more, median cells 12–17 μm wide .... 2a. *D. schreberiana* var. *robusta*
1. Leaves not squarrose and lacking enlarged, clasping base 6
  6. Leaves broad, apex obtuse, base decurrent .... 1. *D. palustris* (in part)
  6. Leaves narrow, apex acute, base nondecurrent 7
    7. Capsules strumose, inclined, often nearly as broad as long .... 7. *D. cerviculata*
    7. Capsules not strumose, erect or inclined, usually much longer than broad 8
      8. Capsules strongly contracted under a portion of mouth making the mouth oblique .... 8. *D. heteromalla*

8. Capsules not contracted under only a portion of mouth but sometimes contracted all around mouth 9
    9. Capsules erect .... 5. *D. rufescens*
    9. Capsules inclined 10
        10. Capsules smooth when dry and empty .... 4. *D. varia*
        10. Capsules ribbed or furrowed when dry and empty .... 6. *D. subulata* (in part)

1. Dicranella palustris (Dicks.) Crundw. *ex* Warb., Trans. Brit. Bryol. Soc. 4(2): 247. 1962.
Bryum palustre Dicks., Pl. Crypt. Brit. fasc. 4: 11. 1801.
[Synonyms: *Anisothecium squarrosum* (Starke) Lindb.; *D. squarrosa* (Starke) Schimp.; *D. squarrosa* f. *fluitans* Grout]
PLATE 70

The broad (often 1 mm wide), squarrose leaves with a clasping, decurrent base, and an obtuse apex render this species easy for recognition.

Habitat: On wet soil or in water, often in open situations, such as stream banks and roadside ditches.

Maritime Distribution: Rare or seldom collected. New Brunswick (Albert, Queen's); Nova Scotia (Annapolis, Inverness, Victoria).

Range: Labrador to Quebec, south to Maine and Ohio; in the west from Alaska to Oregon. Europe, Asia.

Chromosome Number: n = 15.

Remarks: The leaves of *D. squarrosa* f. *fluitans* Grout are not squarrose as in *D. palustris* but the form seems to be similar in all other respects. I believe it is merely an environmental form of *D. palustris*.

2. Dicranella schreberiana (Hedw.) Schimp., Coroll. 3. 1856.
Dicranum schreberianum Hedw., Spec. Musc. 144. 1801.
PLATE 71

Very similar to *D. grevilleana* but differing in the serrate to serrulate leaves with dorsal papillae or teeth on the costae and in the smooth capsules.

Habitat: On moist, usually clay soil in clearings.

Maritime Distribution: Rare. Nova Scotia (Kings). Collected once by *J.S. Erskine 54C2471*, 11 April 1954 at Wolfville-Grand Pré.

Range: Newfoundland to *Manitoba, south to *Pennsylvania, *Ohio, Michigan, *South Dakota, and Montana; in the west from *Alaska, south to California. Europe, *Asia, *Australia, *New Zealand.

Chromosome Number: n = 14, 15.

2a. Dicranella schreberiana var. **robusta** Schimp. *ex* Braithw., J. Bot. 9: 289. 1871.
[Synonym: *D. schreberi* var. *elata* Schimp.]
PLATE 71

Distinguished from the var. *schreberiana* by the broader leaves, 0.5–1.0 mm wide, and leaf cells, 12–17 μm wide.

Habitat: Similar to var. *schreberiana*.

Maritime Distribution: Rare. New Brunswick (Victoria); Nova Scotia (Hants).

Range: Nova Scotia to Ontario, south to New Jersey, *New York, and Michigan; in the west occurring in British Columbia, Alberta, and Washington. Also known from Northwest Territories. Europe.

Chromosome Number: Unreported.

3. Dicranella grevilleana (Brid.) Schimp., Coroll. 13. 1856.
Dicranum schreberi var. *grevilleanum* Brid., Bryol. Univ. 1: 450. 1826.
PLATE 72

This species is extremely close to *D. schreberiana* and differs in the leaves that are entire or serrulate near the apex, the costae that are smooth and the capsules that are plicate or furrowed when dry.

Habitat: On moist soil in ravines, roadside banks, and on rock ledges.

Maritime Distribution: Frequent. New Brunswick (Carleton, Queen's, Restigouche, Victoria); Nova Scotia (Kings, Victoria).

Range: Labrador to Alaska, south to Michigan, Montana, Idaho, and Washington. Europe, *Asia.

Chromosome Number: n = 15.

Remarks: Despite Grout's (1936-39) statement that "Macoun's plants from New Brunswick seem to belong to *D. schreberi*.", I believe that they are better left in *D. grevilleana*.

Crum and Anderson (1981) found so much variation in *D. grevilleana* that they could not recognize it as distinct from *D. schreberiana*.

4. **Dicranella varia** (Hedw.) Schimp., Coroll. 13. 1856.

Dicranum varium Hedw., Spec. Musc. 133. 1801.

PLATE 73

Closest to *D. rufescens* from which it differs by the recurved leaf margins and the inclined to horizontal capsules.

Habitat: On clay or sandy and gravelly soil banks along rivers, roads, or in woods.

Maritime Distribution: Common. New Brunswick (Madawaska, Queen's, Restigouche, Saint John, Victoria); Nova Scotia (Colchester, Hants, Inverness, Kings, Victoria).

Range: Greenland to Alaska, south to *Georgia, Tennessee, Louisiana, Oklahoma, New Mexico, and California. West Indies, *Central America, Europe, Asia, *Africa.

Chromosome Number: n = 14, 15.

5. **Dicranella rufescens** (With.) Schimp., Coroll. 13. 1856.

Bryum rufescens With., Syst. Arr. Brit. Pl. ed. 4,3: 801. 1801.

PLATE 74

The smooth, erect, straight capsule is an important feature used to separate this species from the others known in the Maritimes.

Habitat: On moist, clay banks along rivers, roads, and trails in woods.

Maritime Distribution: Frequent. New Brunswick (Kent, York); Nova Scotia (Colchester, Digby, Halifax, Kings); Prince Edward Island (Queens).

Range: Nova Scotia to Quebec, south to Pennsylvania and *North Carolina; in the west from Alaska, south to California. Europe, Asia.

Chromosome Number: n = 10, 14.

6. **Dicranella subulata** (Hedw.) Schimp., Coroll. 13. 1856.

Dicranum subulatum Hedw., Spec. Musc. 128. 1801.

PLATE 75

The inclined to horizontal capsules that are ribbed or furrowed when dry are distinctive. The species is somewhat similar to *D. heteromalla* but the leaves are ± squarrose from an enlarged, clasping base, the capsules are not erect and they do not have the oblique mouth that is contracted beneath.

Habitat: On moist, often clay soil in open situations, such as stream banks and roadside ditches.

Maritime Distribution: Frequent. New Brunswick (Albert, Kent, Victoria, York); Nova Scotia (Annapolis, Colchester, Halifax, Victoria); Prince Edward Island (Kings, Queens).

Range: Greenland to Quebec, south to New Hampshire and Michigan; in the west from Alaska south to *California, Idaho, and Wyoming. Europe, *Asia.

Chromosome Number: n = 13, 15.

7. **Dicranella cerviculata** (Hedw.) Schimp., Coroll. 13. 1856.

Dicranum cerviculatum Hedw., Spec. Musc. 149. 1801.

PLATE 76

The small (0.5–1.0 mm long), ovoid capsule with a distinct struma makes this plant easy to recognize.

Habitat: On moist, soil banks, often in open situations, such as roadsides, forest clearings, along streams and bluffs beside the ocean.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Madawaska, Saint John); Nova Scotia (Cape Breton, Colchester, Halifax, Inverness, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Labrador to *Manitoba, south to New Jersey, *Michigan, and *Wisconsin; in the west from Alaska, Yukon, and British Columbia. Europe, *Asia.

Chromosome Number: n = 13, 15.

8. **Dicranella heteromalla** (Hedw.) Schimp., Coroll. 13. 1856.

Dicranum heteromallum Hedw., Spec. Musc. 128. 1801.

[Synonym: *D. heteromalla* var. *orthocarpa* (Hedw.) Jaeg. & Sauerb.]

PLATE 77

The most common species of *Dicranella* found in the Maritimes. The dry capsule that is deeply furrowed and has an oblique mouth that is contracted beneath is a good identifying feature.

Habitat: On soil banks in woods and along roads, sometimes on hummocks in woods or on soil over stumps and logs, occasionally in rock crevices or soil pockets of boulders, especially along streams.

Maritime Distribution: Common and probably occurring throughout. New Brunswick (Albert, Charlotte, Kent, Northumberland, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth, St. Paul Island); Prince Edward Island (Kings, Queens).

Range: Newfoundland to Manitoba, south to the Gulf States; in the west from Alaska, south to California. *Central and South America, Europe, Asia, *Africa.

Chromosome Number: n = 13, 14.

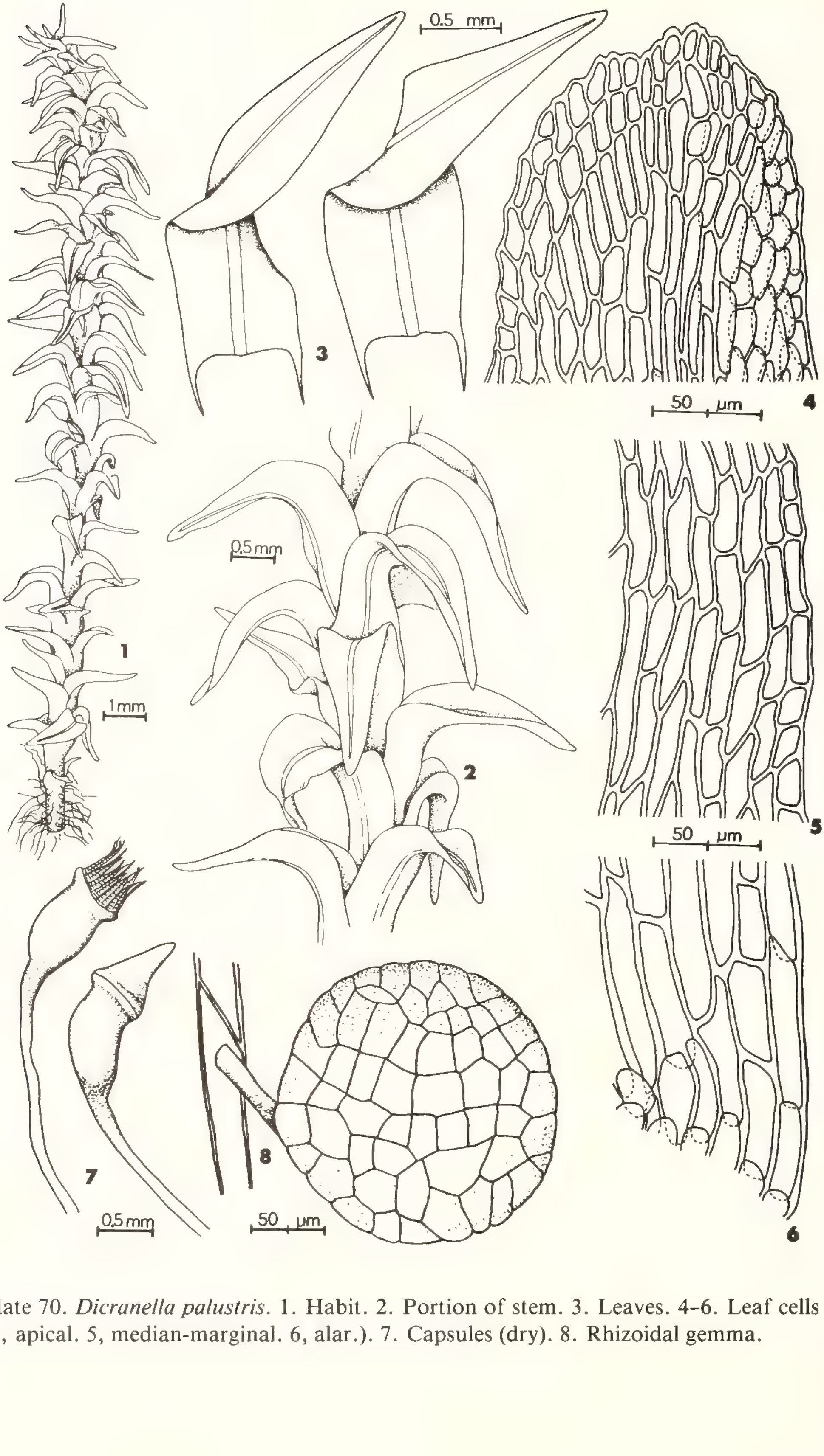
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Plate 70. *Dicranella palustris*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry). 8. Rhizoidal gemma.

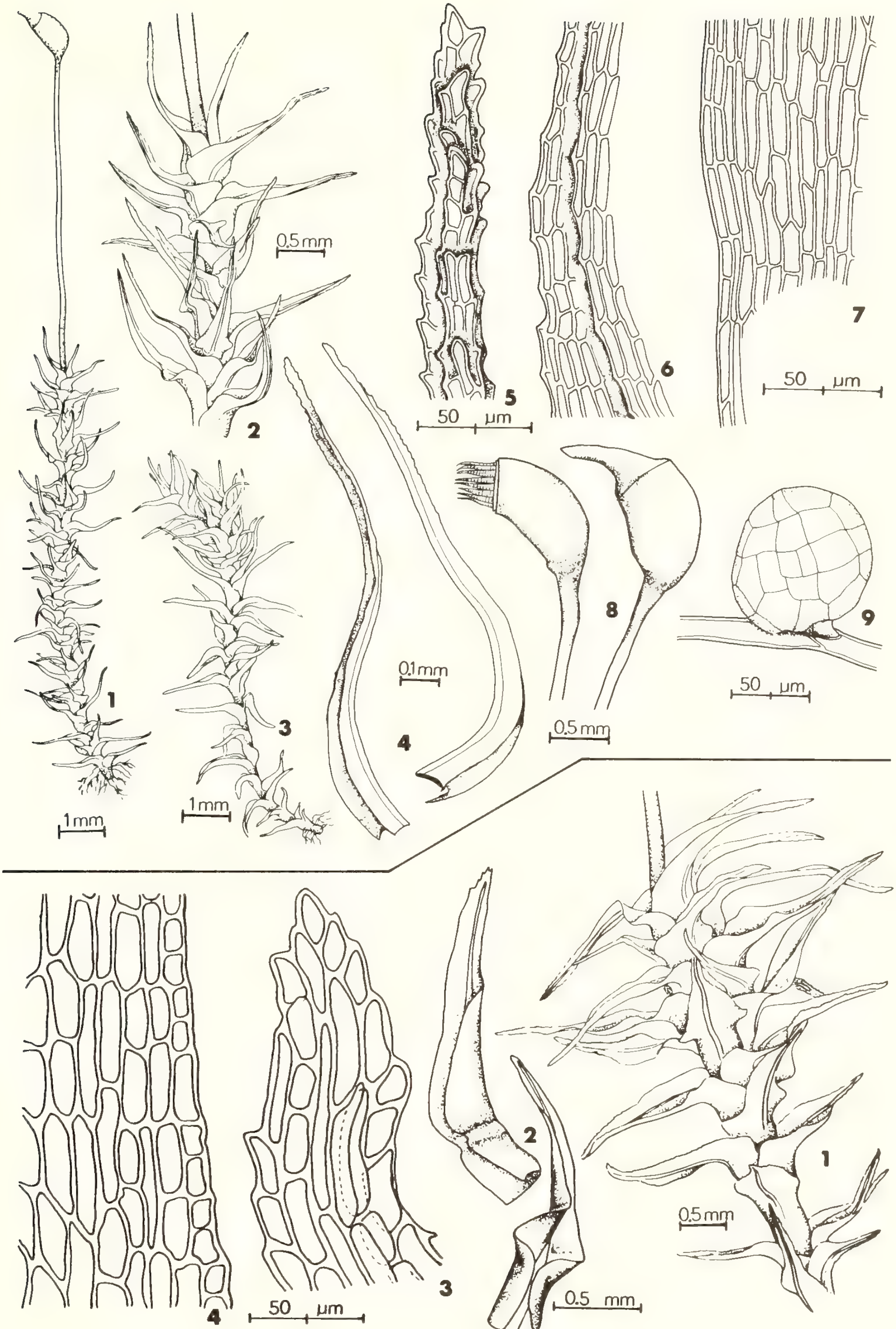
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Plate 71. *Dicranella schreberiana* var. *schreberiana* (above). 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Rhizoidal gemma. *Dicranella schreberiana* var. *robusta* (below). 1. Habit. 2. Leaves. 3–4. Leaf cells (3, apical. 4, median-marginal.).

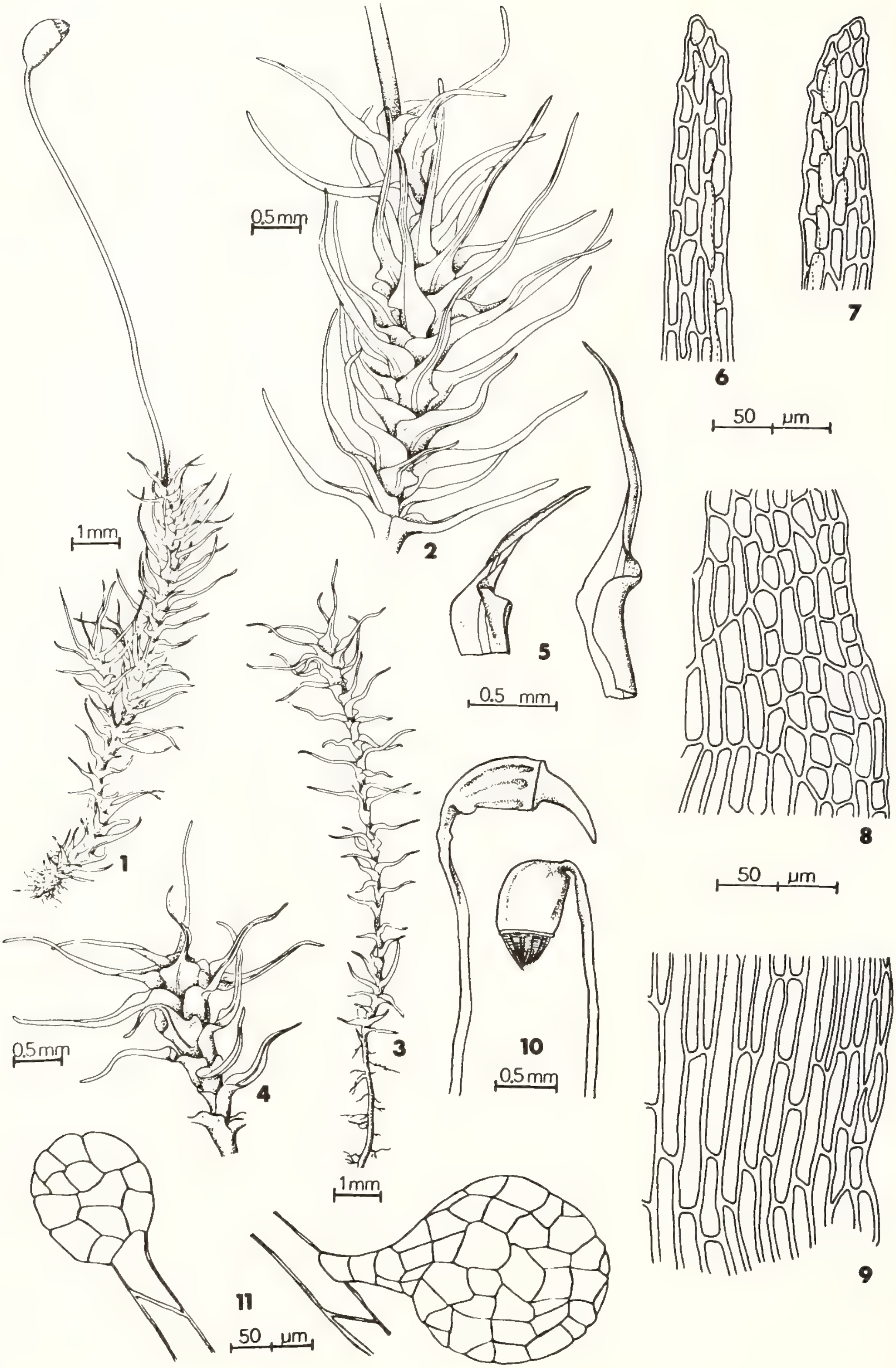
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Plate 72. *Dicranella grevilleana*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Portion of stem with perigonial bud. 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Capsules (dry). 10. Rhizoidal gemmae.

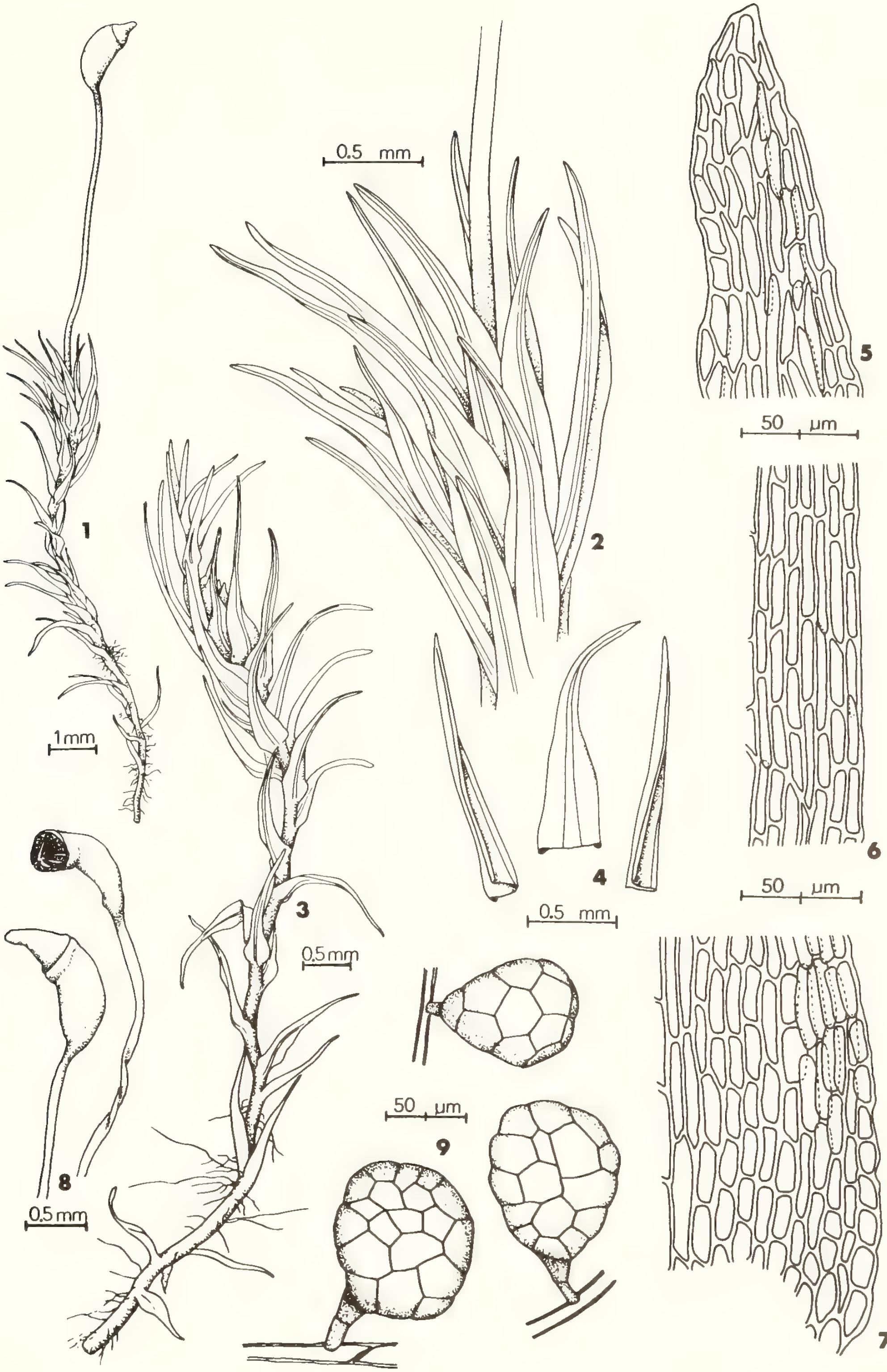
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Plate 73. *Dicranella varia*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Rhizoidal gemmae.

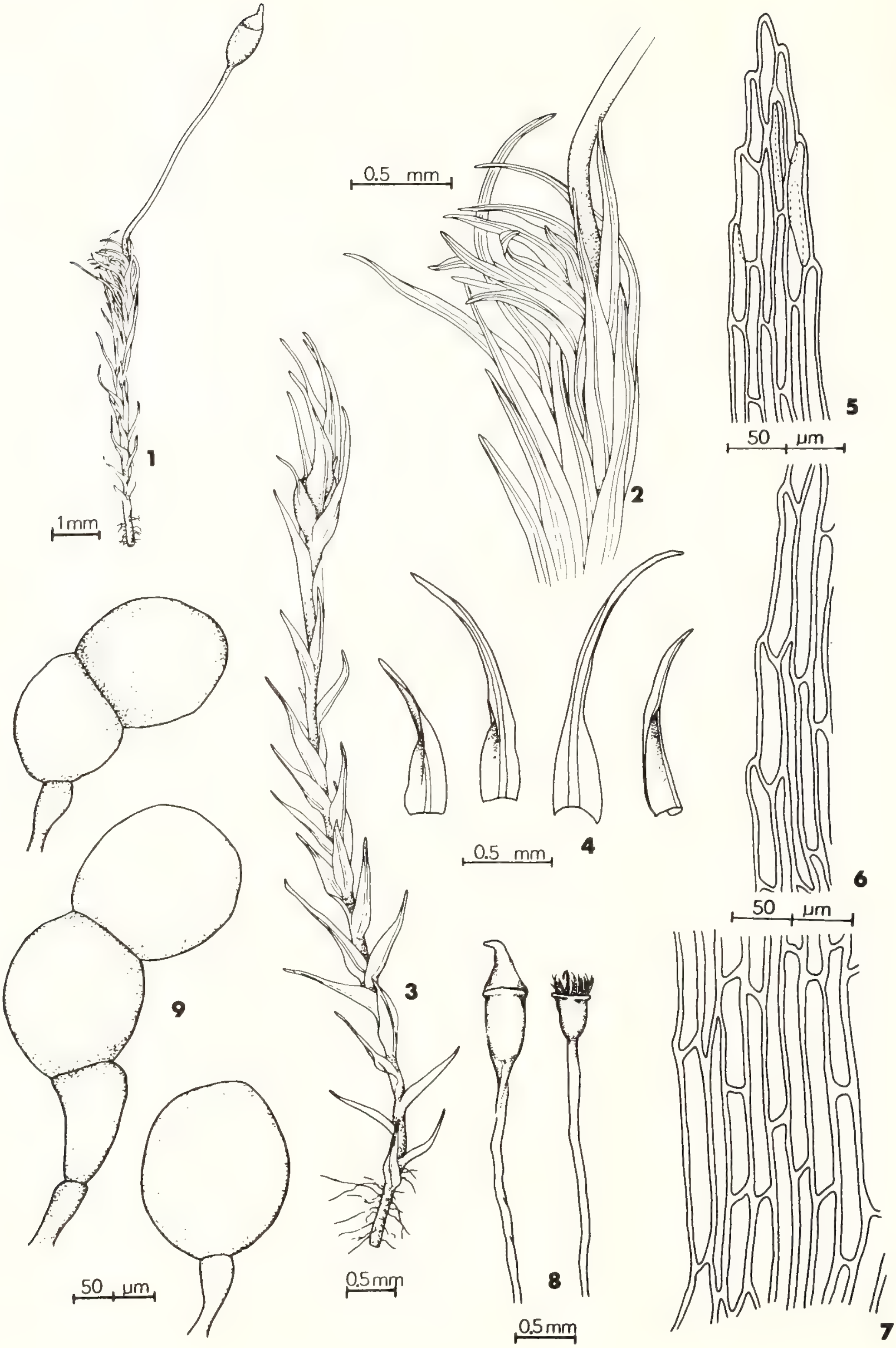
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Plate 74. *Dicranella rufescens*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Rhizoidal gemmae.

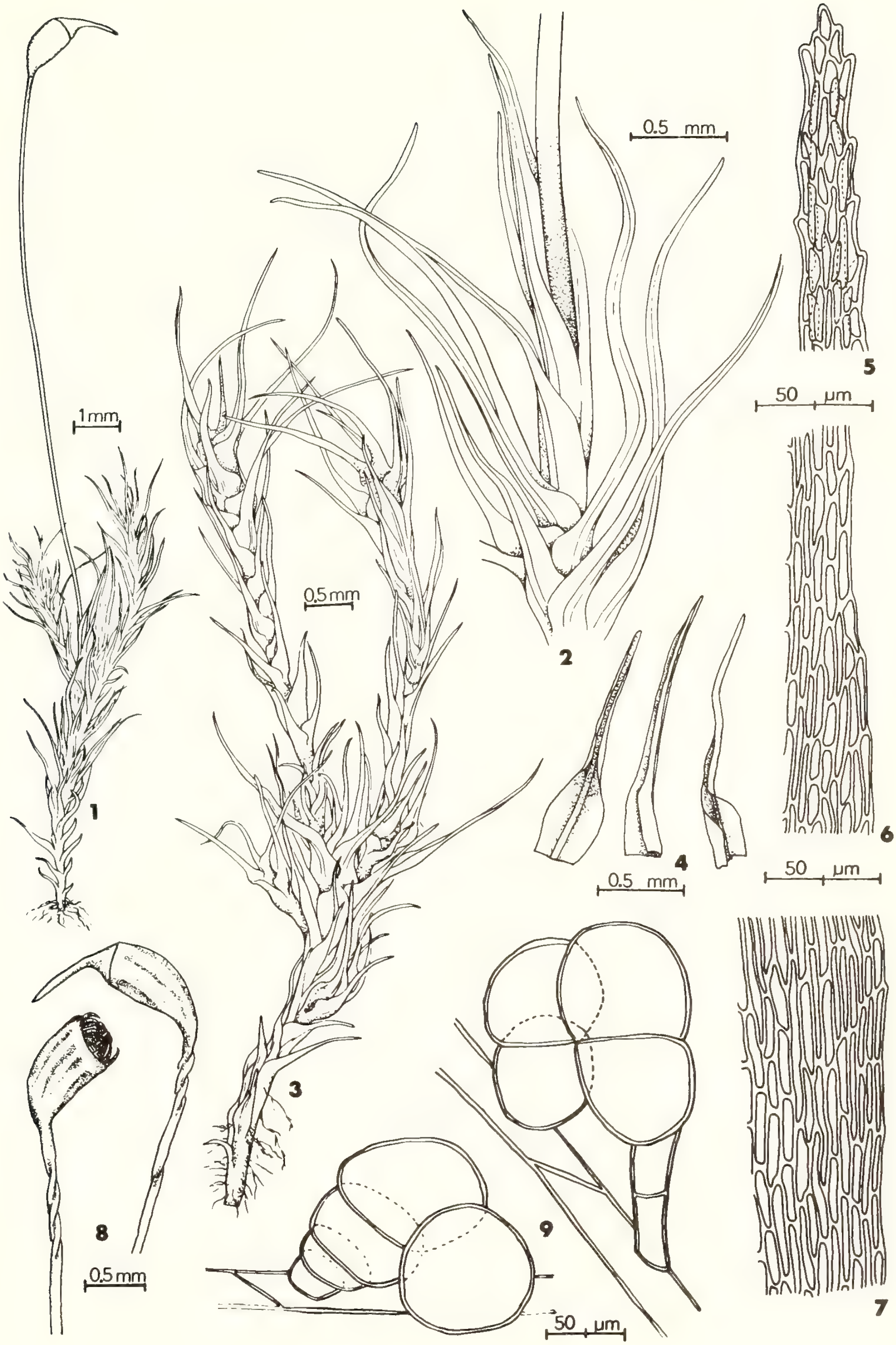
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Plate 75. *Dicranella subulata*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Rhizoidal gemmae.

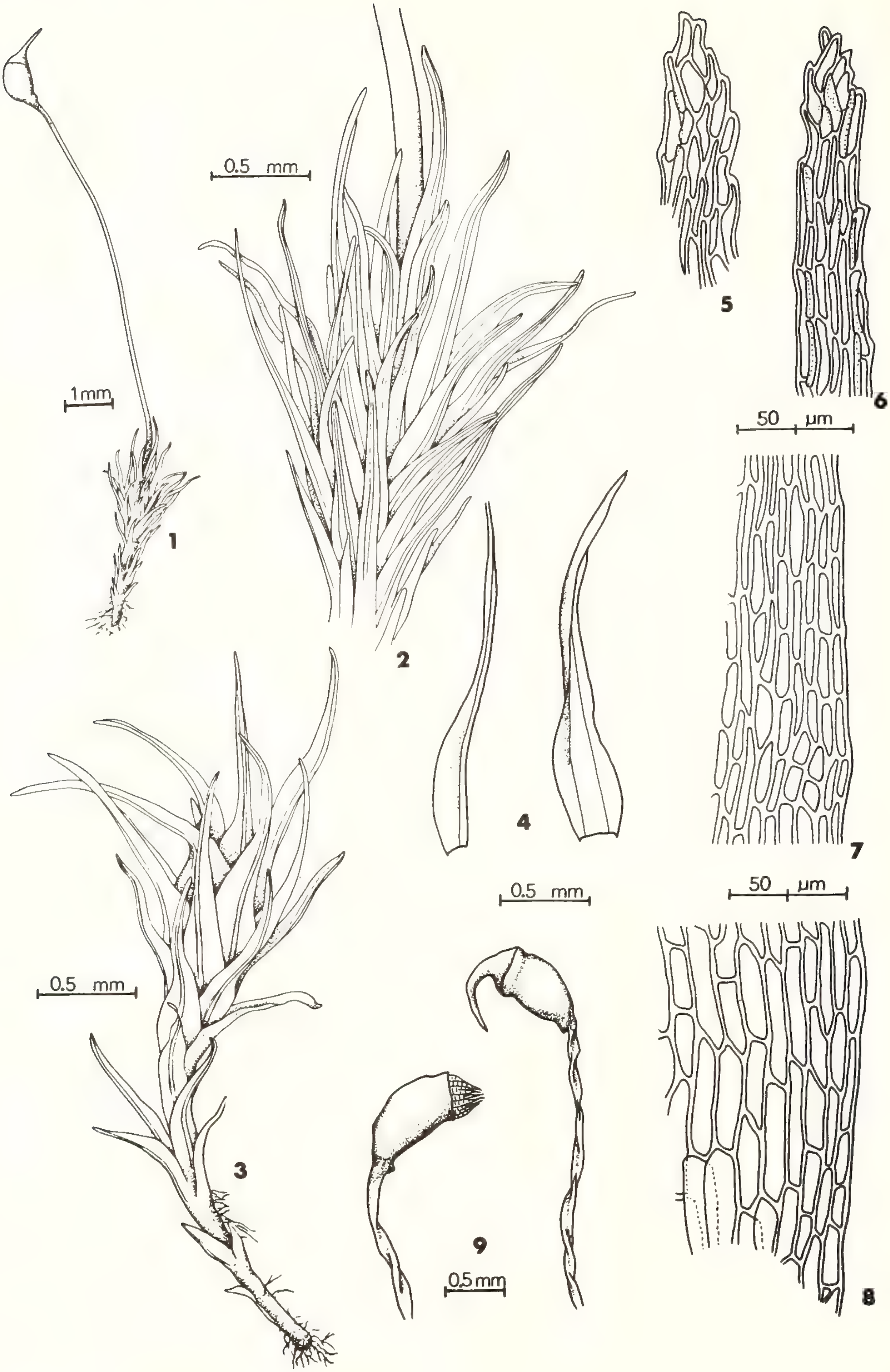

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Plate 76. *Dicranella cerviculata*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5-6, apical. 7, median-marginal. 8, alar.). 9. Capsules (dry).

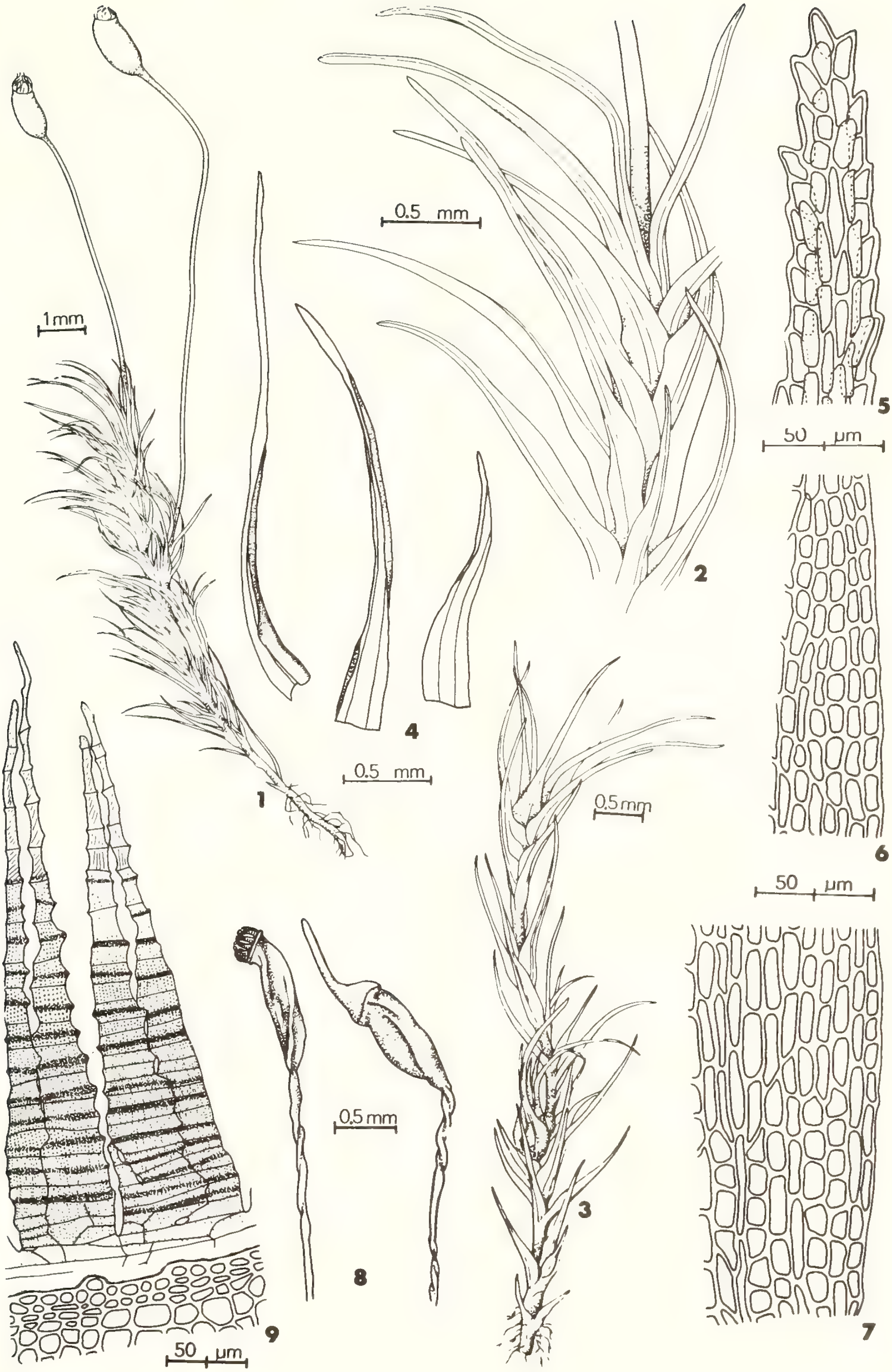
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Plate 77. *Dicranella heteromalla*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Peristome teeth.

3. **Rhabdoweisia** B.S.G., Bryol. Eur. 1: 97. 1846 (fasc. 33–36 Mon. 1).

Habit: In erect, dense cushions or tufts.

Colour: Green to yellowish green above, brown below.

Stems: 0.3–1.0 cm high, erect, simple or with a few branches, rhizoids at base.

Leaves: Erect-spreading, curled and contorted when dry, keeled, lamina unistratose, ligulate to linear-lanceolate, acute, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or sometimes recurved from base to leaf middle, serrate near apex, occasionally nearly entire.

Costae: Single, ending a few cells below apex, prominent on dorsal surface of leaf, often yellowish, with 1–2 stereid bands.

Leaf Cells: Smooth, thin-walled at base, of medium thickness above, lacking pits. Median cells quadrate to transversely elongate, often rounded or elliptic, becoming rectangular and long near the base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perichaetia terminal, perigonial buds at base of plants.

Calyptrae: Cucullate, naked, extending to middle of capsule, yellowish with a reddish tip.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown, becoming reddish brown with age, ovoid to cylindric, straight, erect, distinctly 8-furrowed when dry.

Setae: Straight or nearly so, smooth, twisted when dry, yellow, brown with age.

Annuli: Lacking.

Opercula: Long-rostrate, arcuate.

Peristomes: Single, consisting of 16, orange, undivided, linear to lanceolate teeth, erect or nearly so, smooth below, faintly papillose to obliquely striate above.

Spores: Yellow to yellowish brown, globose, ellipsoidal or reniform, minutely papillose, 14–21 μm in longest dimension.

1. **Rhabdoweisia crispata** (With.) Lindb., Act. Soc. Sci. Fenn. 10: 22. 1871.
Bryum crispatum With., Syst. Arr. Brit. Pl. ed. 4, 3: 816. 1801.
[Synonym: *Rhabdoweisia denticulata* B.S.G.]
PLATE 78

Plants small, stems 3–10 mm high, leaves ligulate to linear-lanceolate, acute, up to 4 mm long, curled and contorted when dry, margins serrate near apex, costae subpercurrent; capsules ovoid to cylindric, straight, erect, distinctly 8-furrowed when dry.

Habitat: On soil over noncalcareous rock ledges or in crevices of cliffs or bluffs, often near waterfalls.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Restigouche, York); Nova Scotia (Digby, Halifax, Kings).

Range: Newfoundland, south in the mountains to North Carolina and *Georgia, west to Wisconsin and Missouri; disjunct to western British Columbia, California (?), and *Alaska. Europe, Asia, *Africa, Pacific Islands.

Chromosome Number: n = 14.

Remarks: Although *Rhabdoweisia crispata* is known to occur only on acidic rocks in the Maritimes, it sometimes grows on sandstone in some localities in the United States.

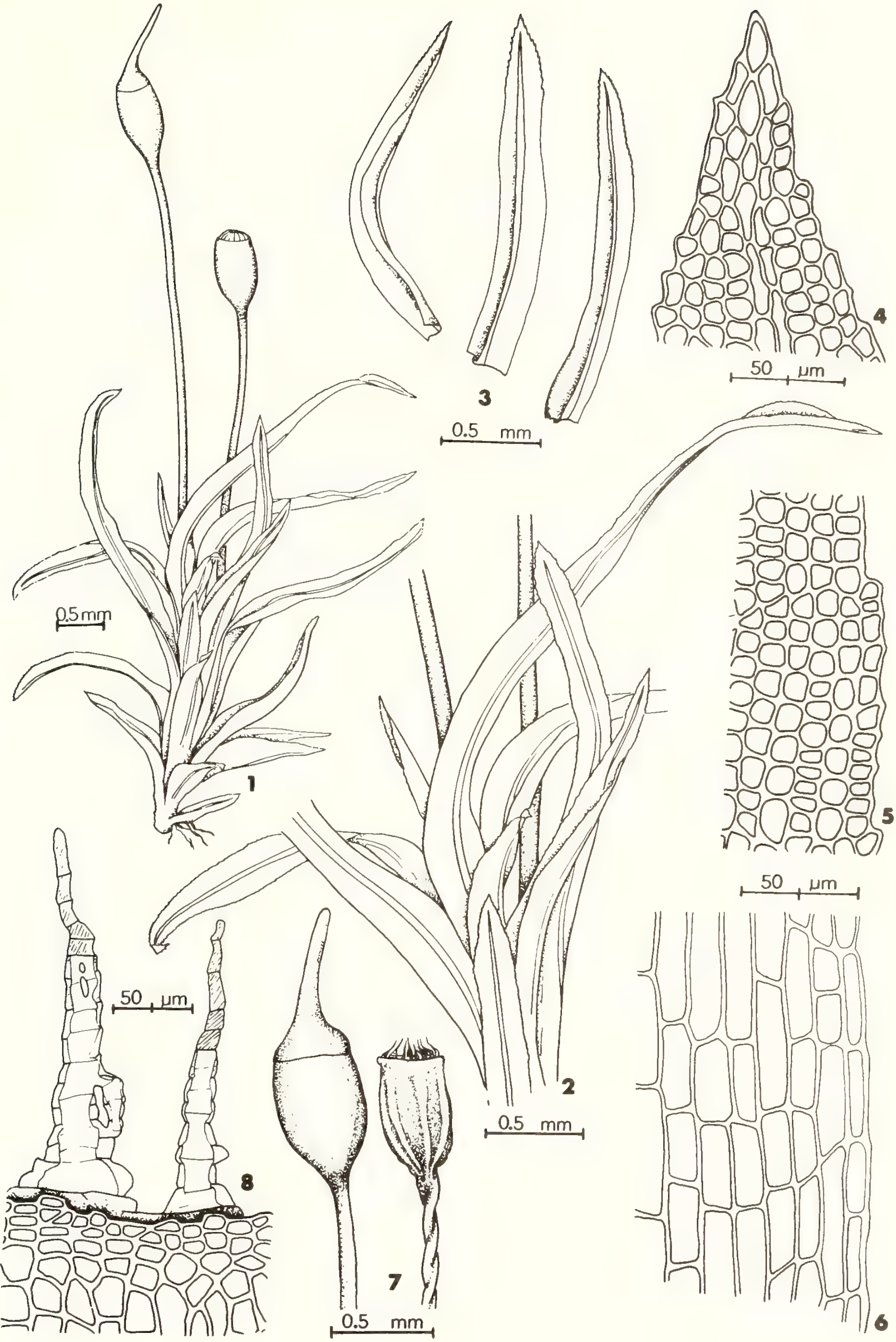
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Plate 78. *Rhabdoweisia crispata*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules, operculate (wet), inoperculate (dry). 8. Peristome teeth.

4. **Cynodontium** B.S.G. *ex* Schimp., Coroll. 12. 1856. *nom. cons.*

Habit: In erect, loose to dense tufts.

Colour: Green to yellowish green above, brown below.

Stems: 0.5–2.0 cm high, erect, simple or branched, rhizoids below apex among leaves.

Leaves: Erect-spreading, crisped when dry, keeled, lamina unistratose or bistratose above on margins, linear-lanceolate to lanceolate, acute to narrowly obtuse, nondecurrent. Perichaetial leaves similar but somewhat larger than vegetative leaves. Perigonial leaves ovate, acute to broadly obtuse.

Leaf Margins: Recurved from base to near leaf apex, serrate to serrulate from apex to leaf middle.

Costae: Single, ending just below apex to shortly excurrent, prominent on dorsal surface of leaf, smooth or roughened on dorsal surface, with 1–2 stereid bands.

Leaf Cells: Smooth or prorate on dorsal surface, the walls of medium thickness, lacking pits. Median cells quadrate to short-rectangular, sometimes rounded or irregularly angled, becoming longer near apex and base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perichaetia terminal, perigonial buds just below.

Calyptrae: Cucullate, naked, yellowish with reddish tip, covering most of capsule, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellow, brown or reddish brown, oblong-ovoid to cylindric, narrowed at the neck when dry, straight or slightly arcuate, erect to somewhat inclined, longitudinally striate when dry, with or without a struma.

Setae: Straight or somewhat flexuose, smooth, twisted when dry, yellow, brown or reddish.

Annuli: Deciduous, of 2–3 rows of large cells, or persistent and narrow, sometimes lacking.

Opercula: Rostrate, arcuate.

Peristomes: Single, consisting of 16, red teeth, divided about halfway into 2 segments, vertically pitted-striolate below, papillose near apex.

Spores: Yellow to greenish yellow, globose, minutely papillose, 14–19 μm.

1. Capsules strumose, slightly curved; perigonial leaves acute or nearly so ..... 2. *C. strumiferum*
1. Capsules not strumose, straight; perigonial leaves broadly obtuse .... 1. *C. alpestre*

1. Cynodontium alpestre (Hüb.) Milde, Bryol. Siles. 51. 1869.
Dicranum gracilescens var. *alpestre* Hüb., Musc. Germ. 255. 1833.
[Synonyms: *C. tenellum* (B.S.G.) Limpr.; *Cnestrum alpestre* (Hüb.) Nyholm *ex* Mogensen]
PLATE 79

Sometimes difficult to distinguish from *C. strumiferum* without capsules but differing in the smaller stems, 0.5–1.5 cm high, shorter leaves, 2–3 mm long, and possession of broadly obtuse perigonial leaves. The straight, nonstrumose capsules, when present, will immediately distinguish the species from *C. strumiferum*.

Habitat: On noncalcareous rock or soil over rock ledges or bluffs, sometimes in crevices.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte); Nova Scotia (Inverness, Victoria).

Range: Greenland and Labrador, south to New York and New Hampshire, west across the continent in the northern United States and southern Canada, and occurring from Alaska, south to British Columbia. Europe, *Asia.

Chromosome Number: n = 14.

2. Cynodontium strumiferum (Hedw.) Lindb., Oefv. K. Vet. Ak. Foerh. 21: 230. 1864.
Fissidens strumifer Hedw., Spec. Musc. 160. 1801.
PLATE 80

Differing from *C. alpestre* in the larger stems, 0.5–2.0 cm high, the longer leaves, 2–4 mm long, the perigonial leaves that are acute or nearly so, and the slightly curved, strumose capsules.

Habitat: On humus and soil over noncalcareous rock ledges and bluffs.

Maritime Distribution: Frequent. New Brunswick (Charlotte); Nova Scotia (Kings, Victoria).

Range: Greenland and Labrador, south to *New England, west across the continent in the northern United States and southern Canada, and occurring from Alaska, south to British Columbia. Europe, Asia.

Chromosome Number: n = 14, 15.

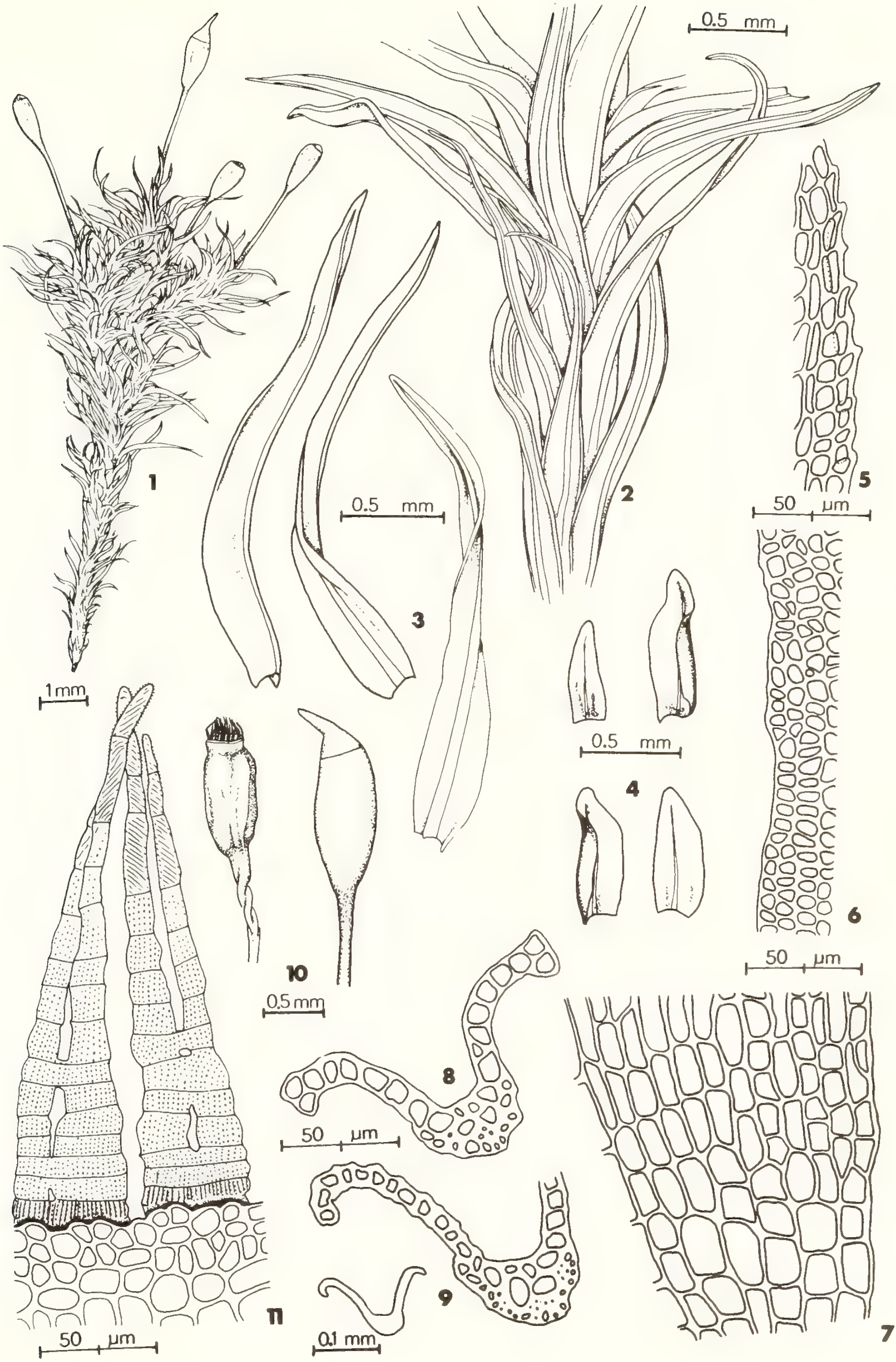
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Plate 79. *Cynodontium alpestre*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Perigonial leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9. Cross-sections of leaves near middle. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome teeth.

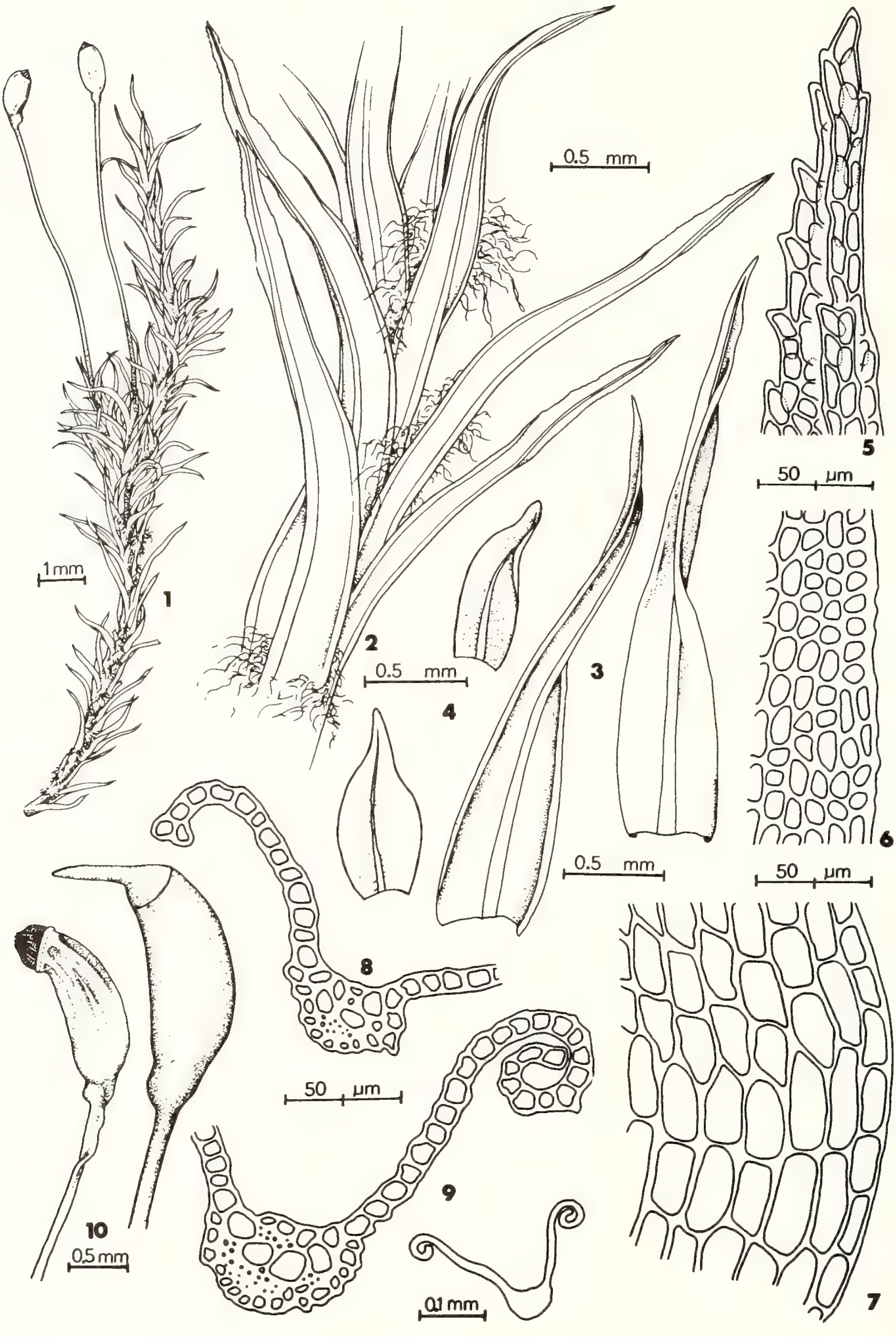
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Plate 80. *Cynodontium strumiferum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Perigonial leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9. Cross-sections of leaves near middle. 10. Capsules, operculate (wet), inoperculate (dry).

5. **Dichodontium** Schimp., Coroll. 12. 1856.

Habit: In erect, loose tufts or sods.

Colour: Yellowish green to dark green, brown below, dull.

Stems: 1-4 cm high, erect, simple or with a few branches, rhizoids at base of stem and at base of branches.

Leaves: Erect-spreading to nearly squarrose, crisped and contorted when dry, somewhat keeled and concave to almost flat, unistratose, ovate-lanceolate to oblong-lanceolate, acute to narrowly obtuse, base broad and clasping, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane above and recurved near base when wet, incurved above when dry, sometimes undulate, irregularly and bluntly serrate near apex, serrulate to below leaf middle.

Costae: Single, ending a few cells below apex to percurrent, protruding somewhat on dorsal surface, roughened by projecting cell ends, with 2 stereid bands.

Leaf Cells: Mammillose to conic-papillose on both surfaces nearly to leaf base, the walls of medium thickness, lacking pits. Median cells quadrate, short-rectangular, transversely elongate, irregularly angled, or rounded, becoming longer near base but with several rows of shorter cells on the margins.

Asexual Reproductive Bodies: Yellowish, cylindrical or globose-stalked gemmae, with thin, smooth walls, often numerous on the stems in leaf axils.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: cucullate, naked, yellowish with a reddish, papillose tip, covering capsule to just below the mouth, fugacious.

Capsules: Solitary, on a seta arising from stem apex, reddish brown or sometimes yellowish brown, cylindric to ovoid, inclined and slightly arcuate or rarely erect and almost straight, smooth, contracted under mouth when dry.

Setae: Straight to somewhat flexuose, smooth, not or somewhat twisted when dry, reddish brown or yellowish brown.

Annuli: Lacking.

Opercula: Rostrate, arcuate, nearly as long as urn.

Peristomes: Single, consisting of 16, dark red teeth divided about halfway into 2 segments, vertically pitted-striolate below, papillose above.

Spores: Yellow to greenish yellow, globose, smooth to minutely papillose, 18-24 μm.

1. **Dichodontium pellucidum** (Hedw.) Schimp., Coroll. 12. 1856.
Dicranum pellucidum Hedw., Spec. Musc. 142. 1801.
PLATE 81

Recognized by the yellowish green to dark green, dull, ovate-lanceolate to oblong-lanceolate leaves, 1-3 mm long, acute to narrowly obtuse, cells mammillose to conic-papillose on both surfaces, and costae subpercurrent to percurrent. The plants rarely produce sporophytes in the Maritimes and reproduction is asexual by yellowish, cylindrical or globose propagula that are present on the stems.

Habitat: On wet soil, often over calcareous rock near waterfalls and along streams.

Maritime Distribution: Common, but usually sterile. New Brunswick (Albert, King's, Queen's, Restigouche, Victoria, Westmorland); Nova Scotia (Annapolis, Cape Breton, Colchester, Hants, Inverness, Kings, Victoria); Prince Edward Island (Kings, Queens).

Range: Labrador and Greenland, south in the mountains to North Carolina, west to Ontario, Michigan, and Ohio; disjunct farther west and known from Montana, *Utah, Arizona and from Alaska, south to California. Europe, Asia.

Chromosome Number: n = 14.

Remarks: *Oreoweisia serrulata* (Funck) De Not., which has been reported from the Maritimes, is excluded from Canada and most specimens thus named are *Dichodontium pellucidum*.

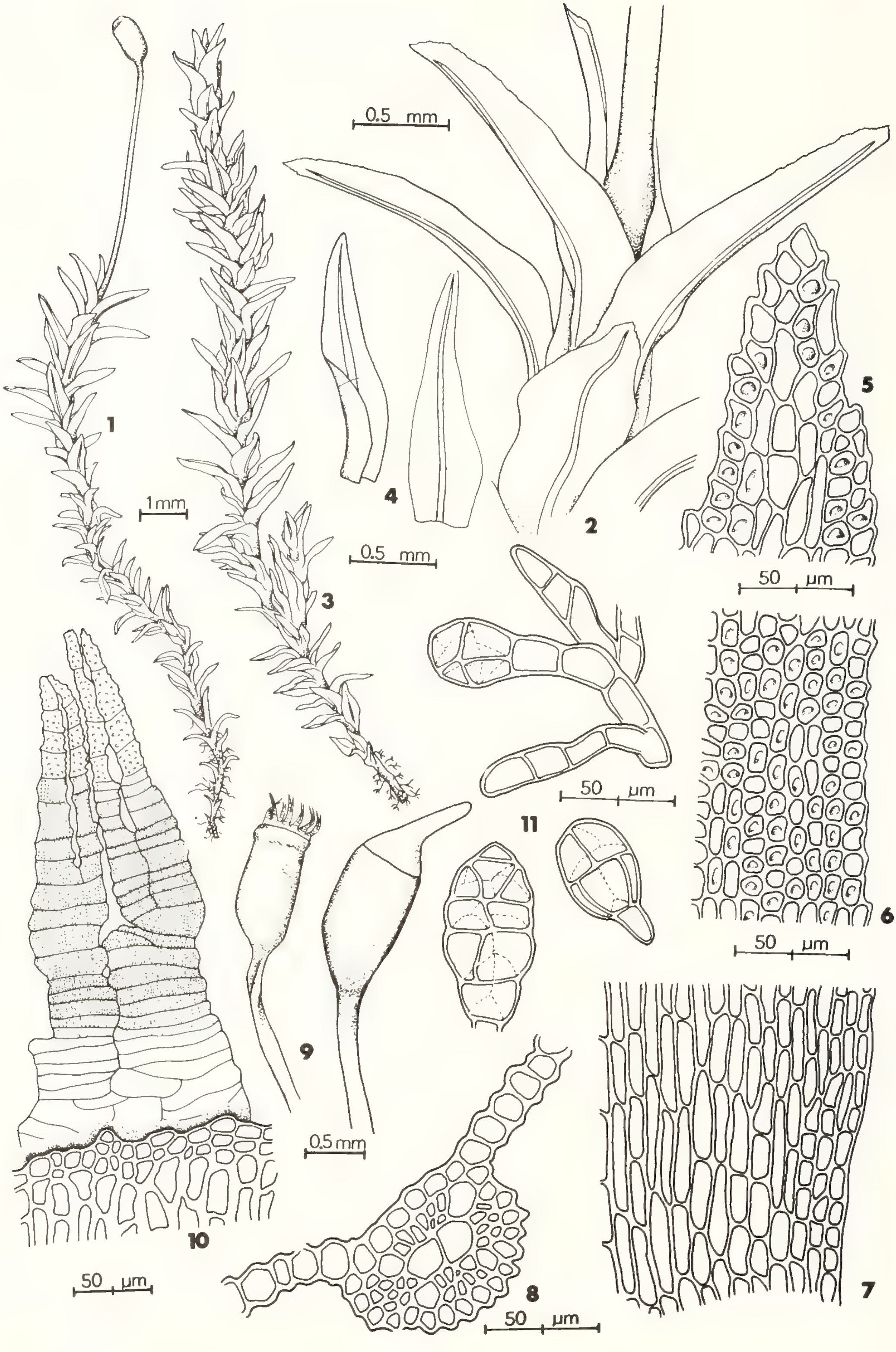
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Plate 81. *Dichodontium pellucidum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of costa near middle. 9. Capsule, operculate (wet), inoperculate (dry). 10. Peristome teeth. 11. Gemmae.

6. **Dicranoweisia** Lindb. *ex* Milde, Bryol. Siles. 48. 1869.

Habit: In erect, dense tufts.

Colour: Yellowish green to dark green above, brown to black below.

Stems: 1–3 cm high, erect, with a few branches, sometimes simple, rhizoids at base.

Leaves: Erect-spreading, somewhat arcuate, crisped when dry, concave, lamina unistratose, reported to be sometimes bistratose above, linear-lanceolate, acute to narrowly obtuse, base oblong, nondecurrent. Perichaetial leaves sheathing base of seta, abruptly acuminate.

Leaf Margins: Plane, erect, entire or serrulate at apex, entire below.

Costae: Single, ending below apex to percurrent, prominent on dorsal surface, often brown, with 1 or 2 stereid bands.

Leaf Cells: Upper cells moderately thick-walled, covered with longitudinal cuticular ridges, lower cells thin-walled, smooth, lacking pits. Median cells quadrate, rounded, short-rectangular or irregularly angled, becoming longer and rectangular near base, alar cells often inflated.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perigonial buds below perichaetia.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex or below, yellowish brown, ellipsoidal to oblong-cylindric, straight or rarely slightly arcuate, erect, smooth, wrinkled when dry.

Setae: Straight, smooth, twisted when dry, yellowish brown.

Annuli: Lacking.

Opercula: Rostrate, arcuate.

Peristomes: Single, consisting of 16, yellowish to reddish, lanceolate teeth, entire or divided $^1/_3$ down, papillose or striate below, papillose above, erect, not twisted.

Spores: Yellow to brownish yellow, globose, minutely papillose, 14–19 μm.

1. **Dicranoweisia crispula** (Hedw.) Lindb. *ex* Milde, Bryol. Siles. 49. 1869.
Weisia crispula Hedw., Spec. Musc. 68. 1801.
PLATE 82

Plants in dense tufts, leaves erect-spreading when moist, crisped when dry, linear-lanceolate from an oblong base, acute to narrowly obtuse, concave, margins plane, erect, entire or serrulate at apex, costae subpercurrent to percurrent, leaf cells covered with longitudinal cuticular ridges, median cells quadrate, rounded, short-rectangular or irregularly angled, alar cells often inflated; autoicous, capsules ellipsoidal to oblong-cylindric, straight or rarely slightly arcuate, erect, smooth, wrinkled when dry, peristome teeth short, yellow to red, erect, not twisted.

Habitat: On noncalcareous rock.

Maritime Distribution: Rare. Nova Scotia (Inverness). Known from one collection near Grand Etang, *C.H. Hand 63-093*, 6 September 1963.

Range: Rare in eastern North America, occurring from Greenland and Labrador to Manitoba, south to Maine, *New York, and Michigan; not uncommon in the west where it occurs from Alaska to Alberta, south to California, Utah, Arizona, and *New Mexico. Europe, *Asia, *Africa, *New Zealand.

Chromosome Number: $n = 11, 14$.

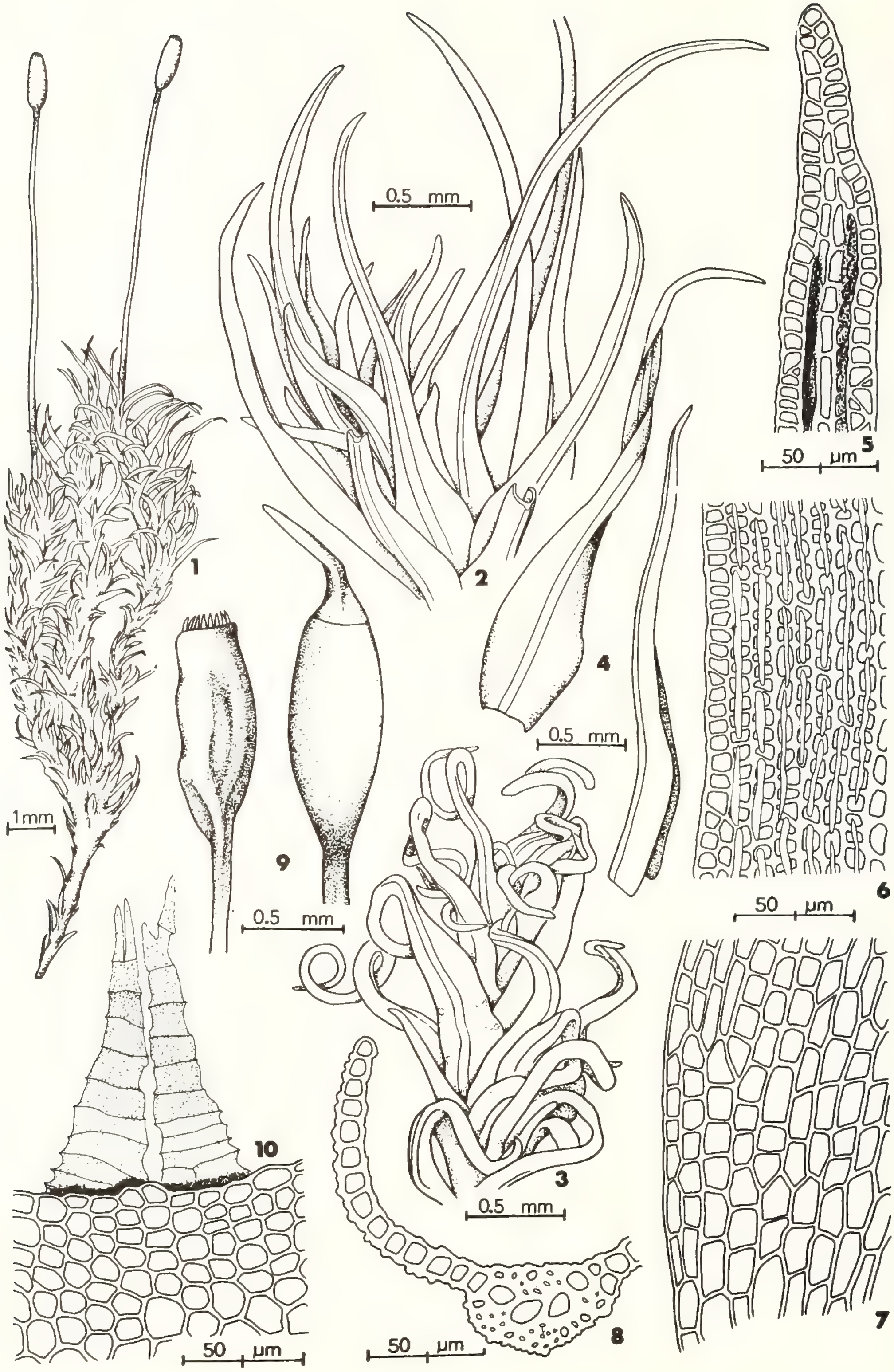
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Plate 82. *Dicranoweisia crispula*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf below middle. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

7. **Oncophorus** (Brid.) Brid., Bryol. Univ. 1: 389. 1826.
Dicranum sect. *Oncophorus* Brid., Mant. Musc. 53. 1819.

Habit: In erect, loose to dense tufts.

Colour: Light green to yellowish green above, brown below, stems appearing whitish due to hyaline leaf bases.

Stems: 1.0–2.5 cm high, erect, simple or branching by innovations, rhizoids below apex among leaves.

Leaves: Squarrose or nearly so, crisped and curled, especially when dry, tubulose below, keeled above, unistratose or bistratose above on margins, oblong to obovate, acute, narrowed to a linear subula, base clasping, nondecurrent. Perichaetial leaves similar to vegetative leaves, clasping base of seta.

Leaf Margins: Erect, broadly recurved at top of clasping base, serrulate to serrate at apex and sometimes to near leaf middle.

Costae: Single, percurrent to shortly excurrent, prominent on dorsal surface of leaf, toothed on dorsal surface to leaf middle, with 2 stereid bands.

Leaf cells: Smooth, thin-walled in clasping base region, thick-walled above, lacking pits. Median cells quadrate to short-rectangular, becoming much longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perichaetia terminal, perigonial buds just below the perichaetium.

Calyptrae: Cucullate, naked, yellowish with black tip, covering most of capsule, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown, reddish at base, oblong-ovoid to cylindric, arcuate, inclined to horizontal, contracted under mouth and wrinkled or smooth when dry, strumose.

Setae: Straight or flexuose, smooth, twisted when dry, yellow to reddish yellow.

Annuli: Lacking.

Opercula: Rostrate, arcuate.

Peristomes: Single, consisting of 16, red teeth, divided about halfway into 2 segments, vertically pitted-striolate below, papillose near apex.

Spores: Yellow to greenish yellow, globose, minutely papillose, 14–24 μm.

1. Oncophorus wahlenbergii Brid., Bryol. Univ. 1: 400. 1826.
[Synonym: *Cynodontium wahlenbergii* (Brid.) C. Hartm.]
PLATE 83

The distinct capsules help one to immediately identify this species. The capsules are yellowish brown, oblong-ovoid to cylindric, inclined to horizontal, strumose and possess red peristome teeth. Sterile plants are equally easy to recognize because of the squarrose, crisped and curled leaves that have an oblong to obovate clasping base that is narrowed to a linear subula.

Habitat: Frequently on rotten logs and stumps, sometimes on tree bases (especially on *Thuja* in swamps), on soil or humus over rock.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Hants, Kings, Lunenburg, Queens, Shelburne, Victoria); Prince Edward Island (Kings).

Range: Greenland and Labrador, west across the continent to Alaska, south to British Columbia, *Montana, Colorado, *South Dakota, Minnesota, Michigan, and *West Virginia. Europe, Asia.

Chromosome Number: n = 14.

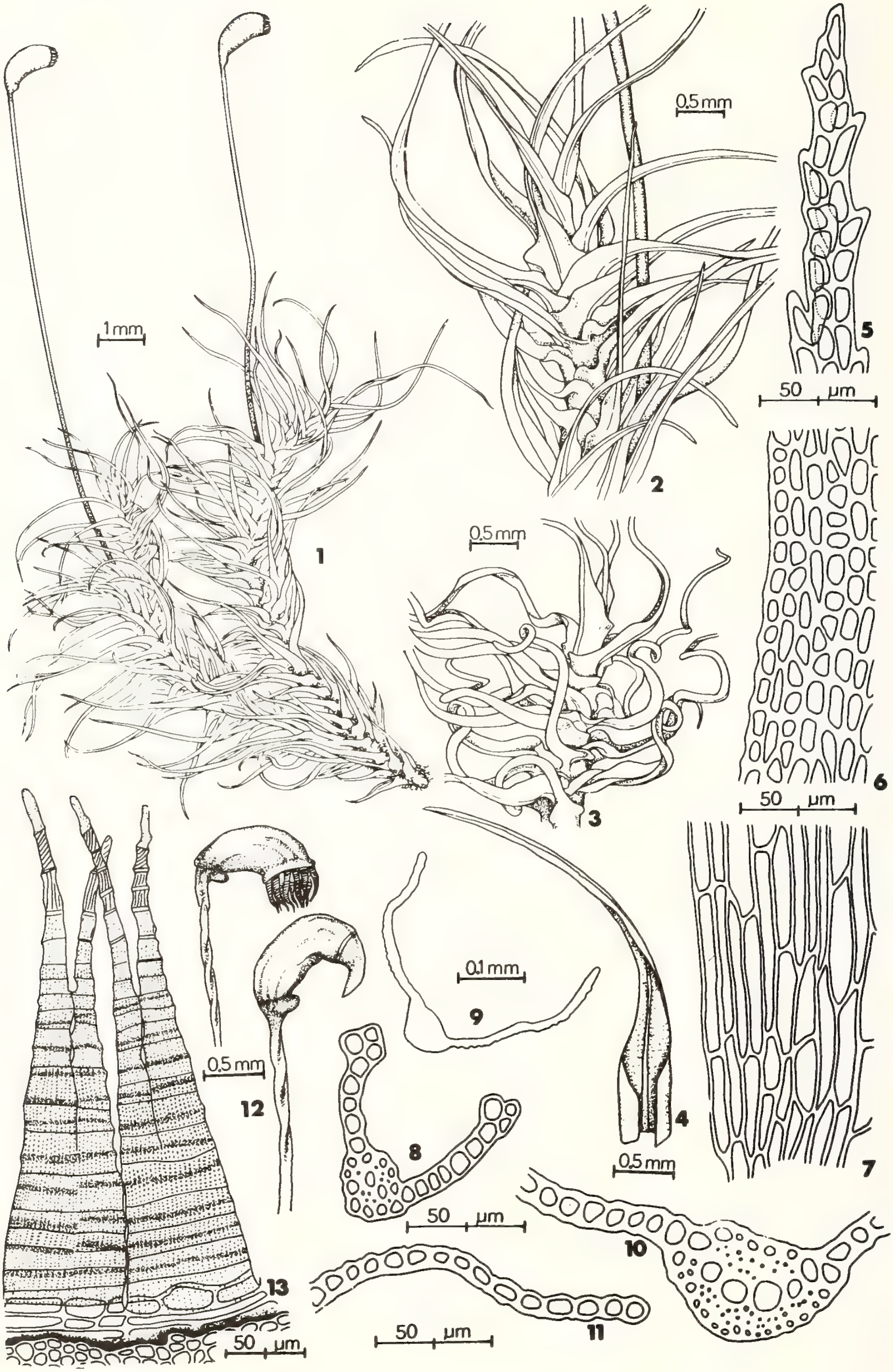
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Plate 83. *Oncophorus wahlenbergii*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaf. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9. Cross-section of leaf near middle. 10. Cross-section of costa below middle. 11. Cross-section of leaf margin near middle. 12. Capsules (dry). 13. Peristome teeth.

8. **Kiaeria** Hag., K. Norske Vid. Selsk. Skrift. 1914(1): 109. 1915.

Dicranum sect. *Falcata* B.S.G., Bryol. Eur. 1: 117. 1847 (fasc. 37–40 Mon. 11).

Habit: In erect, dense tufts.

Colour: Dark green to yellowish green or brownish green.

Stems: 1.0–2.5 cm high, erect, simple or sometimes branched, rhizoids below apex among leaves.

Leaves: Erect-spreading to falcate-secund, somewhat crisped and curled when dry, concave, lamina unistratose or sometimes bistratose above (*K. blyttii*), lanceolate to subulate, acute to narrowly obtuse, nondecurrent. Perichaetial leaves broader at base than vegetative leaves.

Leaf Margins: Plane or incurved, entire or serrulate to serrate near apex, sometimes bistratose above (*K. blyttii*).

Costae: Single, percurrent to excurrent, indistinct on dorsal surface of leaf, smooth to papillose or serrulate on dorsal surface from apex to leaf middle, lacking stereid bands.

Leaf Cells: Smooth or prorate on dorsal surface, the walls of medium thickness, only basal cells pitted. Median cells quadrate or rounded to short-rectangular, alar cells enlarged, often inflated and brownish.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perichaetia terminal, perigonial buds below the perichaetium.

Calyptrae: Cucullate, naked, yellowish with reddish tip, covering about half of capsule, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown to dark brown, oblong-ovoid to cylindric, straight or arcuate, erect to inclined, smooth or distinctly ribbed when dry, often contracted under mouth, usually strumose.

Setae: Straight to flexuose, smooth, twisted when dry, yellowish brown to dark brown.

Annuli: Deciduous, of 2–3 rows of large cells.

Opercula: Rostrate, arcuate.

Peristomes: Single, consisting of 16, red teeth, divided about halfway into 2 segments, vertically striate below, papillose near apex.

Spores: Yellow to greenish yellow, globose to ellipsoidal, minutely papillose, 14–24 μm in longest dimension.

1. Leaves unistratose, upper cells elongate, smooth or weakly papillose on dorsal surface, alar cells inflated, clearly differentiated from cells above; perigonia close to perichaetia; capsules distinctly ribbed when dry .... 1. *K. starkei*

1. Leaves sometimes bistratose above on margins, upper cells quadrate to short-rectangular, strongly papillose on dorsal surface, alar cells gradually grading into cells above; perigonia not close to perichaetia, sometimes on separate branches; capsules smooth or indistinctly ribbed when dry .... 2. *K. blyttii*

1. Kiaeria starkei (Web. & Mohr) Hag., K. Norske Vid. Selsk. Skrift. 1914(1): 114. 1915.

Dicranum starkei Web. & Mohr, Bot. Taschenb. 189. 1807.

PLATE 84

Macroscopically, similar in size and appearance to a *Dicranella* or a small *Dicranum* but differing microscopically by the lack of stereid cells, thereby making all the cells of the costa in transverse section appear homogeneous.

Habitat: On sandy soil on rock (apparently noncalcareous).

Maritime Distribution: Rare. Nova Scotia (Victoria). Known only from a single collection from Halfway Brook, *J. Macoun 622*, 6 August 1898.

Range: Newfoundland, south to New Hampshire, disjunct to western North America, occurring from Alaska to California and in Alberta, Idaho, and Montana. *South America, Europe, *Asia, *Australia (?).

Chromosome Number: n = 7, 14.

Remarks: Illustrations of the capsules are from Quebec plants since no sporophytes were present among the many plants in the one collection from Nova Scotia.

2. Kiaeria blyttii (Schimp.) Broth., Laubm. Fennosk. 87. 1923.

Dicranum blyttii Schimp., K. Svenske Vet. Ak. Handl. 3, 34: 164. 1846.

PLATE 85

The leaves are erect-spreading in this species, rather than being falcate-secund as in *K. starkei*. The gradually enlarged alar cells of the leaves, in contrast to the abruptly enlarged ones in *K. starkei*, provide a reliable microscopic difference. Other microscopic differences separating the two taxa are the quadrate to short-rectangular upper leaf cells, strongly papillose on the dorsal surface, and the leaf margins that are sometimes bistratose above in *K. blyttii*, compared with the elongate, smooth or weakly papillose upper cells and the unistratose laminae of *K. starkei*.

Habitat: On sandy soil over noncalcareous boulders on cliff ledges near streams or waterfalls.

Maritime Distribution: Rare. Nova Scotia (Inverness, Victoria).

Range: Labrador, south to New Hampshire and New York, disjunct to western North America where it occurs from Alaska to California and in the *Yukon and Alberta. Europe, *Asia.

Chromosome Number: n = 14.

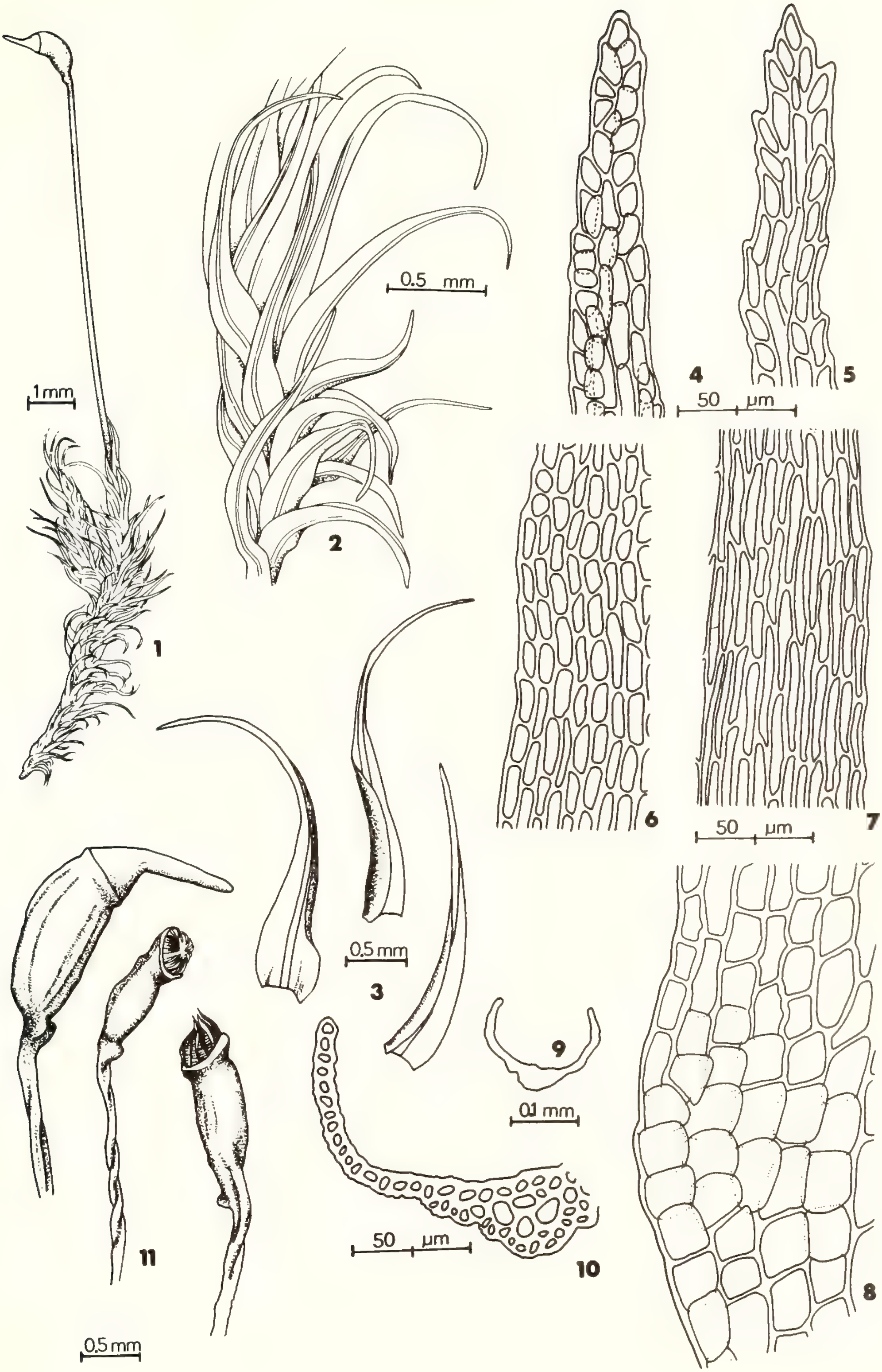
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Plate 84. *Kiaeria starkei*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–8. Leaf cells (4–5, apical. 6, marginal at $^{3}/_{4}$ distance from apex. 7, median-marginal. 8, alar.). 9–10. Cross-sections of leaves near base. 11. Capsules, operculate (wet), inoperculate (dry).

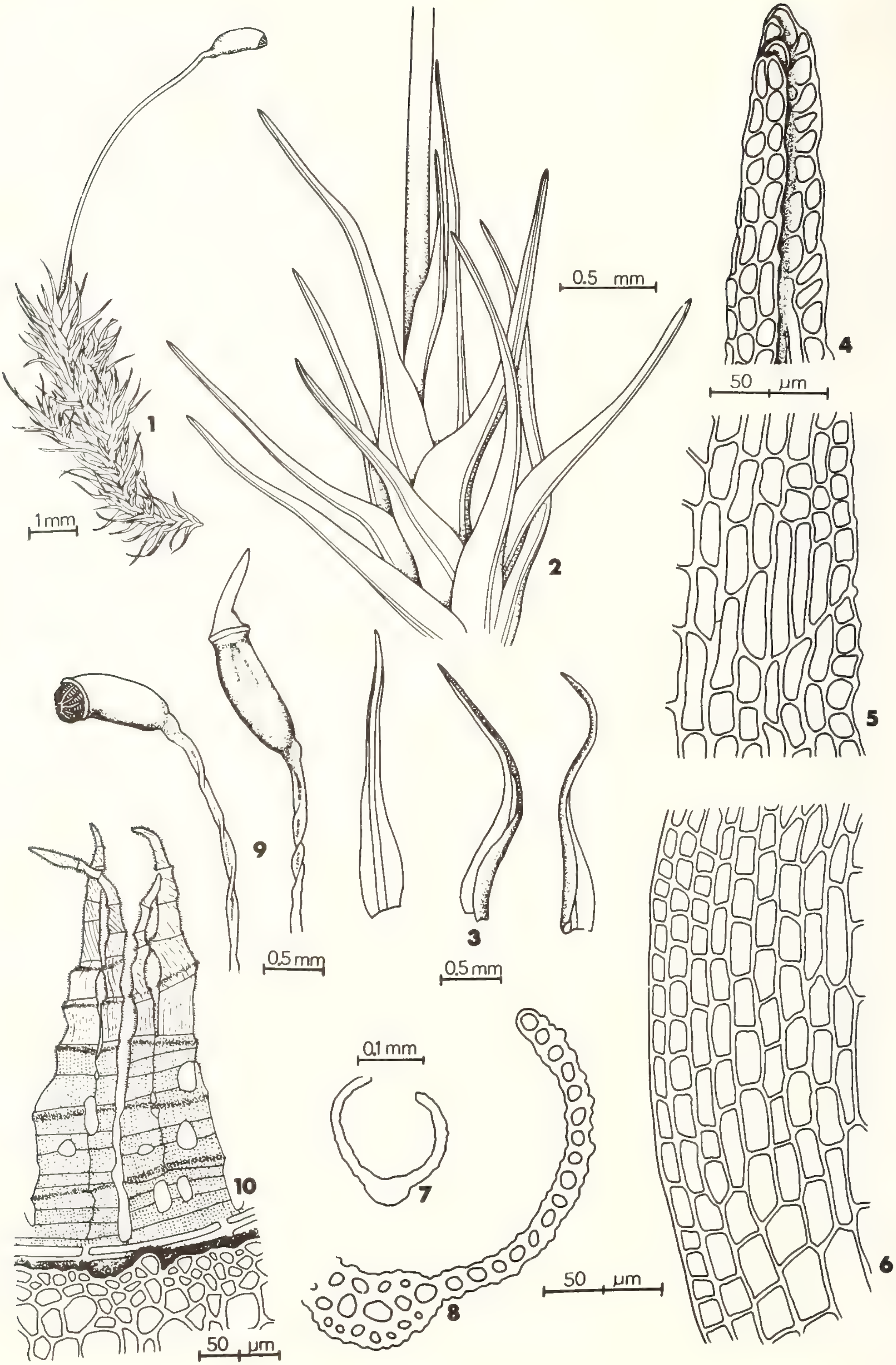
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Plate 85. *Kiaeria blyttii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7–8. Cross-sections of leaves near base. 9. Capsules (dry). 10. Peristome teeth.

9. **Dicranum** Hedw., Spec. Musc. 126. 1801.
[Synonym: *Orthodicranum* (B.S.G.) Loeske]

Habit: In erect, loose to dense tufts.

Colour: Light green, yellowish green or yellowish brown to dark green, brown below, dull or glossy.

Stems: 0.5–12 cm high, erect, simple or sparingly branched, often matted with white or reddish brown rhizoids.

Leaves: Often falcate-secund, sometimes erect to widely spreading and flexuose, often crisped when dry, smooth or undulate, keeled or concave to tubulose, lamina unistratose or bistratose on or near margins and in alar region, lanceolate to ovate-lanceolate, acute to obtuse, apices sometimes deciduous, nondecurrent. Perichaetial leaves differentiated, the inner abruptly acuminate.

Leaf Margins: Plane to incurved or involute, entire to serrate in upper part, entire below.

Costae: Single, percurrent to shortly excurrent, often with 2–4, sometimes more, dorsal ridges, entire or dorsally toothed, 1–2 rows of guide cells and 2 stereid bands.

Leaf Cells: Smooth, mammillose, dorsally papillose or toothed by projecting cell ends, walls often thick, with or without pits. Basal cells elongate, alar inflated, yellowish to brownish, square to rectangular, upper cells shorter than basal, often quadrate, irregularly angled or short-rectangular.

Asexual Reproductive Bodies: Lacking or present as clusters of 1–6, deciduous, terete, flagella, borne in axils of upper leaves, the flagella bearing small, ovate, obtuse, ecostate leaves closely appressed to the axils or sometimes reproduction by deciduous leaf apices.

Sex: Dioicous (male plants similar to female plants) or pseudomonoicous (male plants dwarf and on the stem rhizoids of the female plants).

Calyptrae: Cucullate, naked, yellowish with reddish tip, covering most of capsule, fugacious.

Capsules: Solitary or up to 6 per perichaetium, on a seta arising from stem apex, yellow, brown or reddish, cylindric, straight or arcuate, erect to horizontal, smooth, becoming wrinkled, striate or sulcate when dry, sometimes strumose when dry.

Setae: Straight to flexuose, smooth, twisted when dry, yellow, brown or reddish.

Annuli: 1–3 rows of large cells, deciduous or persistent, sometimes lacking.

Opercula: Long-rostrate, straight or arcuate.

Peristomes: Single, consisting of 16, red teeth, vertically pitted-striolate below, papillose above, divided about halfway into 2–3 segments.

Spores: Yellowish green to brownish green, globose to ovoid, minutely papillose, 9–28 μm in longest dimension.

The genus *Dicranum* is commonly referred to as "Fork Moss" because of the forked peristome teeth.

1. Plants with most leaf apices broken off; usually sterile, occurring on wood, rarely on rock ..... 13. *D. viride*
1. Plants with most leaf apices present, rarely with a few apices broken; often fruiting, occurring on wood and various other substrates 2
    2. Leaf cells in upper one-third of leaf mostly quadrate, short-rectangular or rounded, usually less than 2:1, the walls with few or no pits 3
        3. Plants with 1–6 terete flagella in some of the upper leaf axils .... 14. *D. flagellare*
        3. Plants lacking axillary flagella 4
            4. Leaves often undulate or rugose, especially near the apex 5
                5. Costae ending below apex to percurrent; leaf apices broadly acute; setae solitary 6
                    6. Leaves ovate to ovate-lanceolate; leaf cells strongly papillose above ..... 9. *D. spurium*
                    6. Leaves lanceolate to oblong-lanceolate; leaf cells smooth to weakly papillose above ..... 6. *D. undulatum*

5. Costae percurrent to excurrent; leaf apices narrowly acute; setae solitary to aggregate 7

7. Leaf cells commonly spinulose or strongly papillose; setae often aggregate .... 7. *D. ontariense*

7. Leaf cells smooth or weakly papillose; setae solitary .... 8. *D. condensatum* (in part)

4. Leaves not undulate or rugose 8

8. Leaf laminae entirely bistratose above or with a few unistratose regions .... 12. *D. fulvum*

8. Leaf laminae unistratose or with some bistratose regions on or near the margins 9

9. Leaves small, usually less than 5.0 mm long and 0.5 mm wide .... 11. *D. montanum*

9. Leaves large, usually 5–10 mm long and 0.5–1.0 mm wide 10

10. Upper leaf margins commonly with bistratose regions; capsules usually ± strumose .... 10. *D. fuscescens*

10. Upper leaf margins unistratose; capsules not strumose .... 8. *D. condensatum* (in part)

2. Leaf cells in upper one-third of leaf mostly elongate, usually more than 2:1, the walls with many pits 11

11. Costae with a double row of guide cells (best observed at base of leaf); leaves 10–15 mm long; setae often aggregate .... 5. *D. majus*

11. Costae with one row of guide cells; leaves often less than 10 mm long; setae solitary or aggregate 12

12. Leaves undulate 13

13. Stems densely matted with a whitish or reddish-brown tomentum; leaves strongly toothed; setae usually aggregate .... 1. *D. polysetum*

13. Stems without or with little tomentum; leaves weakly toothed; setae solitary or rarely two per perichaetium .... 3. *D. bonjeanii* (in part)

12. Leaves not undulate 14

14. Costae with 2–4 dorsal ridges 15

15. Leaves weakly toothed, usually broadly acute .... 3. *D. bonjeanii* (in part)

15. Leaves strongly toothed, narrowly acute .... 2. *D. scoparium*

14. Costae lacking dorsal ridges .... 4. *D. leioneuron*

1. Dicranum polysetum Sw., Monthl. Rev. 34: 538. 1801.
[Synonyms: *D. rugosum* (Funck) Hoffm. *ex* Brid.; *D. undulatum* Ehrh. *ex* Web. & Mohr]
PLATE 86

Plants erect, light green to yellowish green, glossy, in loose to dense tufts, stems 3–10 cm high, densely matted with whitish to reddish brown rhizoids; leaves 6–10 mm long, 1–2 mm wide, wide-spreading, falcate-secund at stem tips, flexuose, little changed when dry, lanceolate, acute, keeled, strongly transversely undulate, lamina unistratose except for bistratose alar region, margins narrowly inrolled at base, plane above, strongly toothed in upper half, costae ending below apex, the upper half with 2 serrated ridges on the dorsal surface, cross-section with a row of guide cells and two stereid bands, the dorsal and ventral epidermal layers of cells not differentiated, leaf cells elongate, smooth, pitted, alar cells inflated, yellowish or brownish, quadrate to rectangular, lacking pits, median cells 61-108 × 9-12 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1–6 per perichaetium, yellow, brown or reddish brown, arcuate, inclined to horizontal, smooth or wrinkled when dry, 2.0–3.5 mm long, exserted on yellow, brown or reddish brown setae, 1.5–3.5 cm long, opercula 2–4 mm long, spores 12–24 μm.

Habitat: On soil or humus in woodlands, sometimes in swamps and at margins of bogs.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, King's, Madawaska, Northumberland, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Colchester, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Newfoundland to Alaska, south to North Carolina, Michigan, Illinois, Missouri, South Dakota, Wyoming, and Washington. *Central America, Europe, Asia.

Chromosome Number: n = 11, 12, 13, 14.

Remarks: Commonly called the "Wavy *Dicranum*" because of the undulate leaves.

2. **Dicranum scoparium** Hedw., Spec. Musc. 126. 1801.
[Synonyms: *D. scopariforme* Kindb.; *D. canadense* Kindb. *ex* Mac.; *D. consobrinum* Ren. & Card.; *D. bonjeanii* var. *alatum* Barnes]
PLATE 87

Plants erect, in loose to dense tufts, stems 2–7 cm high, sparsely to densely matted with whitish or reddish brown rhizoids; leaves 4–10 mm long, 0.8–1.5 mm wide, falcate-secund, sometimes nearly straight and erect, little changed or somewhat crisped when dry, lanceolate to ovate-lanceolate, acute, concave below, keeled above, lamina unistratose except for bistratose alar region, margins plane or incurved, strongly serrate above, costae ending below apex to shortly excurrent, the upper part with 4, sometimes 2–3, serrated ridges on the dorsal surface, cross-section with a row of guide cells and two stereid bands, the dorsal and ventral epidermal layers of cells not differentiated, leaf cells elongate, smooth, pitted, alar cells inflated, yellowish or brownish, quadrate to rectangular, lacking pits, median cells 38-104 × 9–16 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1 or rarely 2 per perichaetium, yellowish brown to reddish brown, arcuate, inclined to horizontal, smooth, striate or wrinkled when dry, 3–4 mm long, exserted on yellowish brown to reddish brown setae, 2.0–3.5 cm long, opercula 3.0–3.5 mm long, spores 16–24 μm.

Habitat: Mainly on soil and humus in forests, sometimes on rotting logs and stumps or humus over rock.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, King's, Madawaska, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth, Sable Island, St. Paul Island); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to Florida, Alabama, Louisiana, South Dakota, New Mexico, Idaho, and Oregon. Europe, *Central and *South America, Asia, *Africa, Australia, *New Zealand.

Remarks: This is an extremely common and polymorphic species throughout the Maritime Provinces, as well as most of North America. It is commonly known as the "Broom Moss" because the falcate-secund leaves give the plants the appearance of an old straw broom.

3. **Dicranum bonjeanii** De Not *ex* Lisa, Elenco Muschi Torino 29. 1837.
[Synonym: *D. palustre* B.S.G.]
PLATE 88

Plants erect, in loose to dense tufts, stems 2–6 cm high, sparsely to densely matted with whitish to reddish brown rhizoids; leaves 4–6 mm long, 1.0–1.5 mm wide, erect-spreading, sometimes nearly appressed, flexuose, little changed when dry, lanceolate to ovate-lanceolate, mostly broadly acute, concave below, concave to weakly keeled above, usually transversely undulate, lamina unistratose except for bistratose alar region, margins plane or incurved, serrate above, costae ending below apex, the upper part with 2, rarely 4, serrated ridges on the dorsal surface, cross-section with a row of guide cells and two stereid bands, the dorsal and ventral epidermal layers of cells not differentiated, leaf cells elongate, smooth, pitted, alar cells inflated, yellowish or brownish, quadrate to rectangular, lacking pits, median cells 56–112 × 7–12 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1 or rarely 2 per perichaetium, yellowish brown to reddish brown, arcuate, inclined, smooth, somewhat sulcate when dry, 2.5–3.0 mm long, exserted on yellowish brown to reddish brown setae, 2.5–4.0 cm long, opercula 1.7–2.2 mm long, spores 19–28 μm.

Habitat: On humus or in water in fens and meadows.

Maritime Distribution: Rare. Nova Scotia (Inverness); Prince Edward Island (Queens).

Range: Poorly known because of confusion with *D. scoparium*; seen from Labrador, Newfoundland, Prince Edward Island, Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, Ohio, Michigan, Colorado, and Alaska. Europe, Asia.

Chromosome Number: n = 12, 14.

Remarks: This species has been chronically confused with *D. scoparium* by many bryologists and growth studies may indeed prove that it is merely an environmental form growing in a calcareous, often hydric habitat. The mostly erect, nearly straight, undulate leaves with broadly acute apices, weakly toothed margins, and usually only two dorsal ridges will serve to distinguish *D. bonjeanii* from *D. scoparium*. There is also a certain macroscopic resemblance to *D. undulatum* Brid. but microscopically the two bear little similarity.

4. **Dicranum leioneuron** Kindb. *ex* Mac., Bull. Torrey Bot. Cl. 16: 92. 1889.
PLATE 89

Plants erect, in dense tufts, stems 2–9 cm high, sparsely to densely matted with whitish to reddish brown rhizoids; leaves 4–7 mm long, 1.0–1.5 mm wide, erect-spreading, often nearly appressed, straight or flexuose, little changed when dry, lanceolate to ovate-lanceolate, mostly broadly acute, sometimes narrowly obtuse, tubulose, lamina unistratose except for bistratose alar region, margins involute, entire, often serrulate at apex, a portion of the stem often julaceous, the leaves obtuse, short, oval, concave, appressed, costae ending below apex, the upper part smooth or sometimes with 2 weakly serrated ridges on the dorsal surface, cross-section with a row of guide cells and two stereid bands, the dorsal and ventral epidermal layers of cells not differentiated, leaf cells elongate, smooth, pitted, alar cells inflated, yellowish or brownish, quadrate to rectangular, lacking pits, median cells 38–85 × 9–16 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1 per perichaetium, yellowish brown, arcuate, inclined, smooth, somewhat sulcate when dry, 2.0–3.5 mm long, exserted on yellow to yellowish brown setae, 3–4 cm long, opercula 2.0–2.5 mm long, spores 16–24 μm.

Habitat: In *Sphagnum* hummocks in bogs.

Maritime Distribution: Rare. Nova Scotia (Cape Breton, Guysborough, Halifax, Inverness, Victoria); Prince Edward Island (Kings).

Range: Poorly known but seen from Newfoundland, Prince Edward Island, Nova Scotia, Quebec, Ontario, and British Columbia. Europe.

Chromosome Number: Unreported.

Remarks: The taxonomy of this species was recently clarified by Ahti and Isoviita (1962) who noted its close morphological similarity to *D. bonjeanii* and to some forms of *D. scoparium*. The julaceous regions formed by the appressed, short, concave, obtuse leaves present on many stems help to distinguish *D. leioneuron* which apparently occurs only in bogs.

5. **Dicranum majus** Sm., Fl. Brit. 3: 1202. 1804.
PLATE 90

Plants erect, in loose tufts, stems 3–10 cm high, sparsely matted with whitish to reddish brown rhizoids; leaves 8–12 mm long, 1–2 mm wide, falcate-secund, flexuose, little changed when dry, lanceolate to ovate-lanceolate, acute, concave to tubulose below, keeled near apex, lamina unistratose, sometimes bistratose on or near the margins, alar region bi- to multistratose, margins involute below, plane above, serrate in upper half, costae percurrent to shortly excurrent, dorsally toothed in upper half, dorsal ridges lacking, cross-section with two rows of guide cells and two stereid bands, the dorsal epidermal layer and sometimes the ventral epidermal layer of cells differentiated, leaf cells elongate, smooth, apical cells often dorsally prorate or toothed by projecting cell ends, basal cells pitted, apical and median cells usually pitted, alar cells inflated, yellowish or brownish, quadrate to rectangular, lacking pits, median cells 38–85 × 9–14 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1–4 per perichaetium, yellow to dark brown, arcuate, inclined to horizontal, smooth or striate when dry, 2–3 mm long, exserted on yellow to light brown setae, 2.5–5.0 cm long, opercula 2–3 mm long, spores 14–19 μm.

Habitat: On soil and humus on banks in woodlands, rarely on cliffs or in bogs.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Saint John); Nova Scotia (Cumberland, Halifax, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth, St. Paul Island); Prince Edward Island (Kings, Queens).

Range: Predominantly an oceanic species, occurring in Greenland, Labrador, Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Northwest Territories, Alberta, British Columbia, Washington, and Alaska; reported in the New England States. Europe, Asia.

Chromosome Number: n = 11, 12, 13.

6. **Dicranum undulatum** Brid., Jour. f. Bot. 1800. 1(2): 294. 1801.

[Synonyms: *D. bergeri* Bland.; *D. rugosum* Kindb.]

PLATE 91

Plants erect, in dense tufts, stems 3–12 cm high, densely matted with reddish brown rhizoids; leaves 5–9 mm long, 0.8–1.2 mm wide, erect-appressed, sometimes ± falcate, somewhat contorted when dry, lanceolate to oblong-lanceolate, broadly acute, rarely narrowly acute, keeled, undulate, lamina unistratose except for bistratose alar region, margins plane, sometimes involute at base and broadly recurved at apex, serrulate to serrate in upper half, costae ending a few cells below apex, rarely percurrent, smooth or dorsally toothed near apex, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal epidermal layer with a few or all the cells differentiated, leaf cells elongate below, becoming irregularly angled to rectangular near apex, the wall between the cells often bulging dorsally and ventrally, smooth or rarely dorsally prorate above, basal cells strongly pitted, upper cells with few or no pits, alar cells inflated, yellowish to brownish, square to rectangular, with few or no pits, median cells 9–99 × 5–9 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1 per perichaetium, brown to reddish brown, arcuate, inclined to horizontal, striate when dry, 2–3 mm long, exserted on yellow to brown setae, 2.0–3.5 cm long, opercula 2–3 mm long, spores 14–28 μm.

Habitat: In *Sphagnum* hummocks in bogs, rarely on humus in woodlands.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, Northumberland, Restigouche, Saint John, Sunbury, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Inverness, Kings, Queens, Shelburne, Victoria, Yarmouth, Sable Island, St. Paul Island); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, occurring sporadically in the United States, seen from Maine, Connecticut, New York, New Jersey, Michigan, Wisconsin, Minnesota, Colorado, Montana, and Washington. Europe, *Asia.

Chromosome Number: Unreported.

7. **Dicranum ontariense** Peters., Can. J. Bot. 55: 988. 1977.

[Synonym: *D. drummondii* auct., *non* C. Müll.]

PLATE 92

Plants erect, green or yellowish brown, dull, in loose to dense tufts, stems 3–7 cm high, densely matted below with reddish brown rhizoids; leaves 6–9 mm long, 1.0–1.5 mm wide, erect-spreading, flexuose, sometimes falcate-secund at stem apex, strongly contorted when dry, lanceolate, acute, keeled, undulate, lamina unistratose except for bistratose alar region, margins plane, serrate in upper half, costae percurrent to shortly excurrent, papillose to spinose on numerous, low dorsal ridges, cross-section with a row of guide cells and two stereid bands, the dorsal epidermal layer of cells differentiated, leaf cells rectangular below, quadrate to rectangular above, dorsally papillose above by projecting cell ends, lacking pits or basal cells sometimes pitted, alar cells inflated, yellowish to brownish, rectangular, lacking pits, median cells 9–19 × 5–12 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1–3 per perichaetium, yellow to light brown, often reddish on striations, strongly arcuate, inclined to horizontal, striate, 2–3 mm long, exserted on yellow or reddish yellow setae, 2–3 cm long, opercula 1.5–3.0 mm long, spores 9–19 μm.

Habitat: On humus on forest floor of predominantly coniferous woodlands, rarely at margins of bogs.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Restigouche, Victoria, Westmorland); Nova Scotia (Annapolis, Digby, Halifax, Hants, Inverness, Lunenburg, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Endemic to North America where it occurs from Newfoundland to Saskatchewan, south in the United States to Maine, New Hampshire, New York, *Ohio, Michigan, Wisconsin, and Minnesota; also in Tennessee and North Carolina.

Chromosome Number: n = 12.

Remarks: This appears to be one of the most distinctive species in the Maritimes despite an earlier statement (Ireland in Lawton, 1971) that it may be conspecific with *D. undulatum*. The longer costae and the multiple sporophytes of *D. ontariense* are the easiest and most reliable means of distinguishing it from *D. undulatum*.

Peterson (1977a) clarified the nomenclature of *D. ontariense* which was confused with the European species, *D. drummondii* C. Müll.

8. Dicranum condensatum Hedw., Spec. Musc. 139. 1801.

[Synonym: *D. sabuletorum* Ren. & Card.]

PLATE 93

Plants erect, in dense tufts, stems 1.5–3.0 cm high, densely matted below with reddish brown rhizoids; leaves 2–5 mm long, 0.5–1.0 mm wide, erect-appressed to somewhat spreading, slightly crisped when dry, lanceolate, acute, keeled, lamina unistratose except for bistratose alar region, margins plane to somewhat incurved, serrulate to serrate near apex, costae percurrent to shortly excurrent, smooth or dorsally papillose to toothed in upper half, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal epidermal layer of cells differentiated, leaf cells elongate below, becoming quadrate, irregularly angled, rounded, or rectangular above, the wall between the cells bulging dorsally and ventrally, smooth or rarely dorsally prorate above, basal cells pitted, upper cells lacking pits, alar cells inflated, yellowish to brownish, square to rectangular, with few or no pits, median cells 9–19 × 7–9 μm; inner perichaetial bracts abruptly short-acuminate; pseudomonoicous, capsules at stem apex, 1 per perichaetium, yellow, brown or reddish brown, arcuate, inclined to horizontal, strumose, striate when dry, 1.5–3.0 mm long, exserted on yellow to brown setae, 1.3–2.5 cm long, opercula 1.5–1.7 mm long, spores 19–26 μm.

Habitat: On sandy soil, often over rock, in coniferous woodlands.

Maritime Distribution: Rare. New Brunwick (Victoria, Sable Island).

Range: Endemic to eastern North America, occurring from Nova Scotia to *Wisconsin, south to the Gulf States.

Chromosome Number: n = 12.

Remarks: The three Maritime collections were without capsules although the Sable Island, Nova Scotia one had plants with old setae. The description and illustrations of the sporophytes were obtained from the literature and specimens from Quebec and the eastern United States.

Peterson (1977b) has established the validity of the name *D. condensatum* over the name *D. sabuletorum*.

9. Dicranum spurium Hedw., Spec. Musc. 141. 1801.

PLATE 94

Plants erect, yellowish green or yellowish brown, dull, in loose tufts, stems 1–7 cm high, densely matted below with reddish brown rhizoids; leaves 5–7 mm long, 1.0–1.7 mm wide, erect-spreading, arched toward stem, crisped when dry, ovate to ovate-lanceolate, acute, tubulose, sometimes keeled near apex, often undulate, lamina unistratose except for bistratose alar region, margins plane to involute, serrulate to serrate in upper half, costae percurrent to shortly excurrent, dorsally papillose or toothed near apex, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal epidermal layer with a few cells differentiated, leaf cells elongate below and extending in a V-shaped region up margins, irregularly angled near apex, the wall between the cells bulging dorsally and ventrally, dorsally prorate above, basal cells pitted, upper cells lacking pits or pits indistinct, alar cells inflated, yellowish to brownish, square to rectangular, with few or no pits, median cells 7–33 × 5–14 μm; inner perichaetial bracts abruptly short-acuminate; pseudomonoicous, capsules at stem apex, 1 per perichaetium, yellow, brown or reddish brown, arcuate, inclined to horizontal, strumose, striate when dry, 1.5–2.5 mm long, exserted on yellow, reddish yellow or brown setae, 1–3 cm long, opercula 1.5–2.0 mm long, spores 16–24 μm.

Habitat: On sandy soil or humus, often over rock in woodlands or in open situations, occasionally in bogs.

Maritime Distribution: Frequent. Nova Scotia (Annapolis, Halifax, Hants, Lunenburg, Shelburne, Victoria, Yarmouth, Sable Island); Prince Edward Island (Queens).

Range: In eastern North America, occurring in Newfoundland, Prince Edward Island, Nova Scotia, Quebec, Ontario, New York, Pennsylvania, West Virginia, Virginia, Kentucky, Tennessee, North Carolina, Georgia, Ohio, Michigan, Missouri, and Arkansas. Europe, *Asia.

Chromosome Number: n = 12.

Remarks: The plants have a striking appearance due to the interruptedly foliate stems that have a turgid appearance because of the broad, ovate to ovate-lanceolate leaves.

10. Dicranum fuscescens Turn., Musc. Hib. 60. 1804.

[Synonyms: *D. congestum* Brid.; *D. sulcatum* Kindb. *ex* Mac.; *D. crispulum* C. Müll. & Kindb. *ex* Mac. & Kindb.]

PLATE 95

Plants erect, in loose tufts, stems 1–6 cm high, densely matted with whitish to reddish brown rhizoids; leaves 4–7 mm long, 0.5–1.0 mm wide, somewhat falcate-secund, sometimes erect-spreading and flexuose, crisped when dry, lanceolate, acute, concave below, keeled above, lamina unistratose except for bistratose alar region and bistratose patches on margins, margins plane to incurved, serrulate to serrate in upper half, costae excurrent, dorsally papillose or toothed in upper half, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal epidermal layer of cells differentiated, leaf cells elongate below, quadrate, rectangular or irregularly angled above, the wall between the cells sometimes bulging dorsally and ventrally, often dorsally prorate above, basal cells often pitted, upper cells lacking pits, alar cells inflated, yellowish to brownish, square to rectangular, lacking pits, median cells 9–24 × 7–9 μm; inner perichaetial bracts abruptly long-acuminate; dioicous, male plants similar to female, capsules at stem apex, 1 per perichaetium, brown or reddish brown, arcuate, inclined to horizontal, often somewhat strumose, strongly striate when dry, 1.5–3.0 mm long, exserted on yellow, reddish yellow or brown setae, 1–2 cm long, opercula 1.5–2.0 mm long, spores 14–24 μm.

Habitat: Commonly on rotten stumps or logs, sometimes on bases of trees, soil, or humus on banks or over boulders, rarely in hummocks in bogs.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, King's, Madawaska, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Halifax, Inverness, Kings, Lunenburg, Queens, Richmond, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Widespread from Greenland to Alaska, south to North Carolina, *Florida, Michigan, Wisconsin, Minnesota, New Mexico, Idaho, and California. Europe, *Asia, *South America.

Chromosome Number: n = 8, 9, 10, 11, 12, 24.

Remarks: An extremely variable species throughout most of North America but the Maritime plants are morphologically uniform. The leaves that have bistratose margins in their upper part will distinguish *D. fuscescens* from the other Maritime species.

11. Dicranum montanum Hedw., Spec. Musc. 143. 1801.

[Synonym: *Orthodicranum montanum* (Hedw.) Loeske]

PLATE 96

Plants erect, very slender, in dense tufts, stems 0.5–2.0 cm high, densely matted with reddish brown rhizoids; leaves 2–4 mm long, 0.2–0.5 mm wide, erect-spreading, flexuose, sometimes weakly falcate-secund, strongly crisped when dry, lanceolate, acute, concave below, keeled to concave above, lamina unistratose, alar cells unistratose, margins plane to incurved, serrate to serrulate in upper half, costae percurrent to shortly excurrent, dorsally papillose or toothed in upper half, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal and ventral epidermal layers often with a few cells differentiated, leaf cells linear to rectangular below, quadrate, irregularly angled or short-rectangular above, mammillose, usually dorsally prorate, basal cells sometimes pitted, upper cells lacking pits, alar cells inflated, yellowish to brownish, square to rectangular, with few or no pits, median cells 7–28 × 7–9 μm; inner perichaetial bracts abruptly long-acuminate; dioicous, male plants similar to female, capsules at stem apex, 1 per perichaetium, yellow, brown or reddish brown, straight to slightly arcuate, erect, striate when dry, 1–2 mm long, exserted on yellow, brown or reddish setae, 0.7–1.5 cm long, opercula 1.0–1.5 mm long, spores 12–19 μm.

Habitat: On rotting stumps and logs, sometimes on bark of trees, soil or humus over rock, rarely in bogs.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Madawaska, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Labrador to Manitoba, south to North Carolina, Tennessee, and Missouri; disjunct to British Columbia and Arizona. Europe, *Asia.

Chromosome Number: n = 12, 14.

12. Dicranum fulvum Hook., Musci Exot. 2: 149. 1819.

[Synonyms: *Orthodicranum fulvum* (Hook.) Roth; *Paraleucobryum fulvum* (Hook.) Loeske]

PLATE 97

Plants erect, dark greenish brown, dull, in loose tufts, stems 2–3 cm high, sparsely matted with reddish brown rhizoids; leaves 4–7 mm long, 0.5–0.8 mm wide, weakly falcate-secund to erect and slightly spreading, crisped when dry, apices often deciduous and lacking, narrowly lanceolate, acute, concave, lamina unistratose or bistratose above, sometimes bistratose in patches, alar cells unistratose, margins plane, serrate to serrulate in upper half, costae excurrent, dorsally toothed or papillose in upper half, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal and ventral epidermal layers of cells differentiated, leaf cells rectangular below, quadrate to rectangular above, smooth or dorsally papillose in upper half by projecting cell ends, lacking pits or basal cells sometimes pitted, alar cells inflated, yellowish or brownish, quadrate to rectangular, lacking pits, median cells 5–24 × 5–12 μm; inner perichaetial bracts abruptly long-acuminate; pseudomonoicous, capsules at stem apex, 1 per perichaetium, brown to reddish brown, straight, erect, smooth or somewhat sulcate when dry, 2–3 mm long, exserted on yellow, brown or reddish brown setae, 1.0–1.5 cm long, opercula 1.5–2.0 mm long, spores 16–28 μm.

Habitat: On soil over noncalcareous rock in woodlands.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Queen's, York); Nova Scotia (Annapolis, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Yarmouth).

Range: Nova Scotia to Ontario, south to Georgia, Tennessee, and Arkansas. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: Nova Scotia is the type locality of this *Dicranum* which was described from a collection made in 1785 by Menzies.

13. Dicranum viride (Sull. & Lesq. *ex* Sull) Lindb., Hedwigia 2: 70. 1863.

Campylopus viridis Sull. & Lesq. *ex* Sull., Musci Hep. U.S. 103. 1856.

[Synonyms: *D. fulvum* var. *viride* (Sull. & Lesq. *ex* Sull.) Frye; *Orthodicranum viride* (Sull. & Lesq. *ex* Sull.) Roth; *Paraleucobryum viride* (Sull. & Lesq. *ex* Sull.) Podp.]

PLATE 98

Plants erect, usually dark green, dull, in loose to dense tufts, stems 0.7–3.0 cm high, sparsely matted with whitish to reddish brown rhizoids; leaves 4–7 mm long, 0.5–0.8 mm wide, erect-spreading, sometimes weakly falcate-secund, somewhat curled when dry, apices usually deciduous and lacking, narrowly lanceolate, acute, concave, lamina unistratose or bistratose above, sometimes bistratose in patches, alar cells unistratose, margins plane, entire or nearly so, costae excurrent, smooth, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal and ventral epidermal layers of cells differentiated, leaf cells rectangular below, quadrate to rectangular above, smooth, lacking pits or basal cells sometimes pitted, alar cells inflated, yellowish to brownish, rectangular, lacking pits, median cells 9–19 × 7–12 μm; inner perichaetial bracts abruptly long-acuminate; reported to be dioicous, male plants similar to female, capsules at stem apex, 1 per perichaetium, brown to reddish brown, straight, erect, smooth, sulcate when dry, 2–3 mm long, exserted on yellow, brown or reddish brown setae, 1.0–1.6 cm long, opercula 1.0–1.5 mm long, spores 9–14 μm.

Habitat: On rotten stumps and logs, tree trunks (especially near the base), rarely on soil over calcareous rock.

Maritime Distribution: Common. New Brunswick (Carleton, Charlotte, Kent, Queen's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Colchester, Digby, Halifax, Inverness, Kings, Lunenburg, Queens, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Nova Scotia to Ontario, south to North Carolina, Tennessee, Michigan, and Iowa. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: The near absence of leaf apices on plants of this species serve to distinguish it from almost all other Dicrana in the Maritimes. The deciduous apices presumably regenerate to form new plants and represent a type of asexual reproduction. Sexual reproduction is rare and only two Maritime collections have been seen with capsules.

Dicranum fulvum may be confused with *D. viride* since it also lacks some of its leaf apices but the former has margins that are serrate to serrulate and costae that are often dorsally papillose.

14. Dicranum flagellare Hedw., Spec. Musc. 130. 1801.

[Synonyms: *Orthodicranum flagellare* (Hedw.) Loeske; *D. flagellare* var. *minutissimum* Grout]

PLATE 99

Plants erect, in dense tufts, stems 1-4 cm high, densely matted with reddish brown rhizoids, clusters of 1-6, deciduous, terete, flagella, 1-4 mm long, often borne in axils of the upper leaves, the flagella bearing small, ovate, obtuse, ecostate leaves closely appressed to the axis; leaves 2-5 mm long, 0.3-0.6 mm wide, falcate-secund to erect-spreading, somewhat crisped when dry, lanceolate, acute, concave below, tubulose above, lamina unistratose, alar cells unistratose, margins plane to incurved, entire or serrulate to serrate near apex, costae percurrent to shortly excurrent, sometimes dorsally papillose or toothed near apex, dorsal ridges lacking, cross-section with a row of guide cells and two stereid bands, the dorsal epidermal layer with a few cells differentiated, leaf cells linear to rectangular below, quadrate, irregularly angled or short-rectangular above, the wall between the cells sometimes bulging dorsally and ventrally, smooth or rarely dorsally prorate above, basal cells sometimes pitted, upper cells lacking pits, alar cells inflated, yellowish to brownish, square to rectangular, with few or no pits, median cells 7-28 × 5-14 μm; inner perichaetial bracts abruptly long-acuminate; dioicous, male plants similar to female, capsules at stem apex, 1 per perichaetium, yellow, brown or reddish brown, straight, erect, striate when dry, 2-3 mm long, exserted on yellow, brown or reddish setae, 1-2 cm long, opercula 1.0-1.5 mm long, spores 14-19 μm.

Habitat: Usually on rotting stumps and logs, rarely on humus or soil over rock.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Newfoundland to British Columbia, south to North Carolina, Alabama, Louisiana, South Dakota, and Montana. Mexico, West Indies, Europe, *Asia, *Africa.

Chromosome Number: n = 12, 23.

Remarks: The cluster of flagella in the leaf axils, which serve as a type of asexual reproduction for the plants, make this species easy to recognize. Plants that lack the flagella may be difficult to distinguish from *D. montanum* but the leaves are sufficiently different to readily distinguish the two species. The upper half of the leaf of *D. flagellare* is tubulose and entire or nearly so, while in *D. montanum* it is keeled to concave and strongly papillose or toothed. Also, the leaves of *D. flagellare* are usually less contorted than those of *D. montanum*.

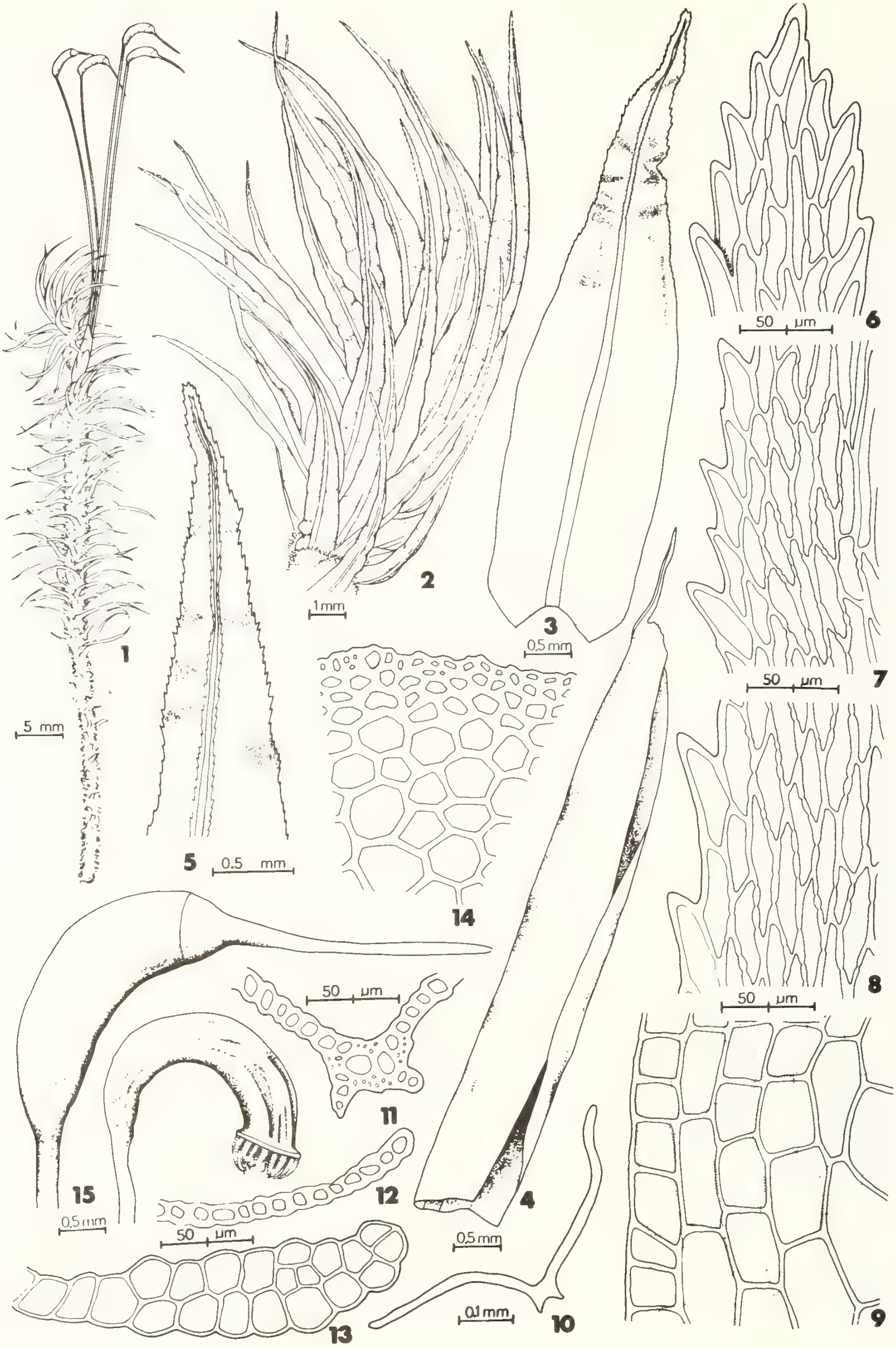
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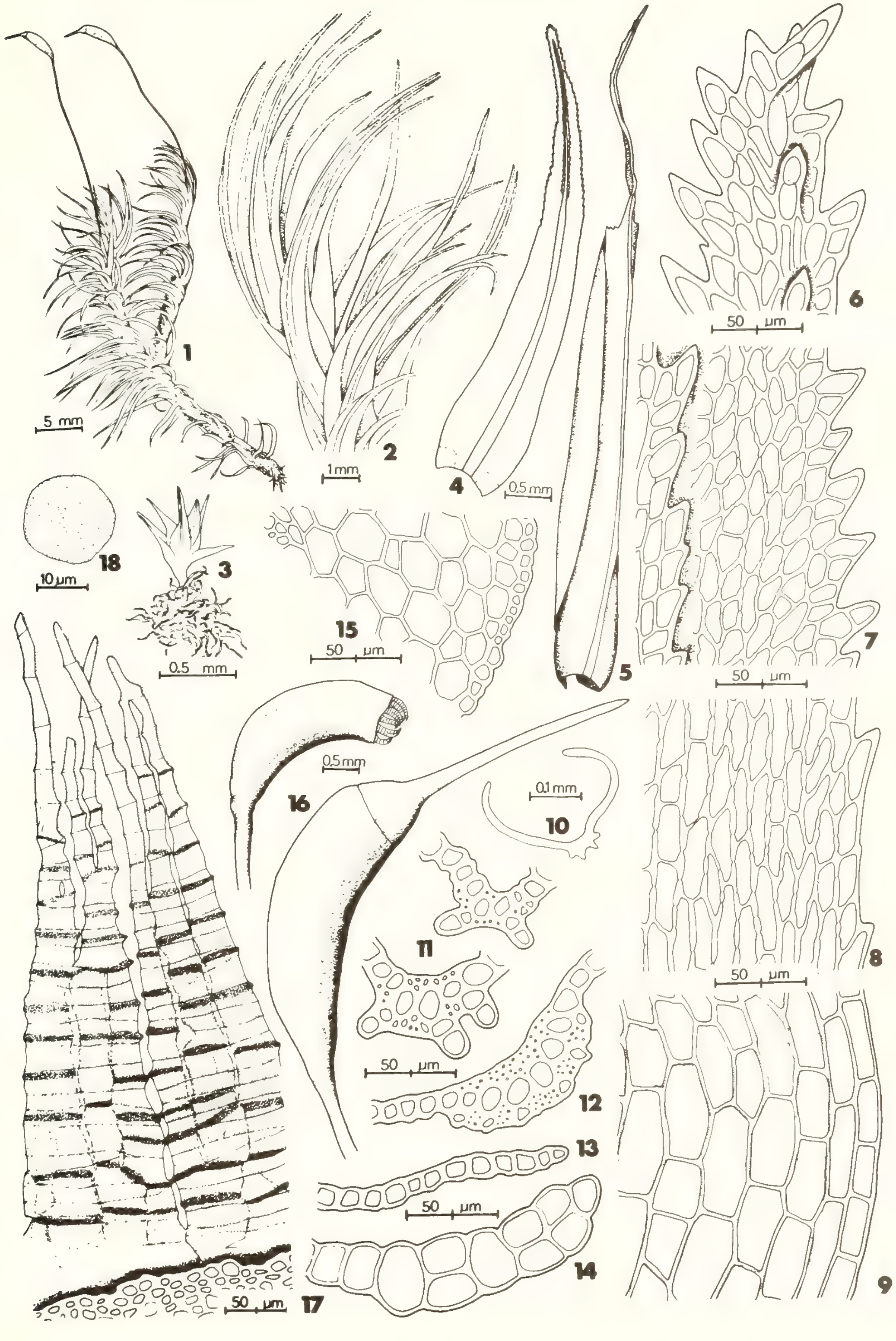
Plate 86. *Dicranum polysetum*. 1. Habit. 2. Portion of stem. 3. Leaf (dorsal view). 4. Perichaetial leaf. 5. Dorsal-apical portion of leaf. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near apex. 11. Cross-section of costa near apex. 12. Cross-section of marginal cells above middle. 13. Cross-section of alar cells. 14. Cross-section of portion of stem. 15. Capsules, operculate (wet), inoperculate (dry).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14
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Plate 87. *Dicranum scoparium*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (dorsal view). 5. Perichaetial leaf. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near apex. 11. Cross-sections of costae near apex. 12. Cross-section of costa near base. 13. Cross-section of marginal cells near base. 14. Cross-section of alar cells. 15. Cross-section of portion of stem. 16. Capsules, operculate (wet), inoperculate (dry). 17. Peristome teeth. 18. Spore.

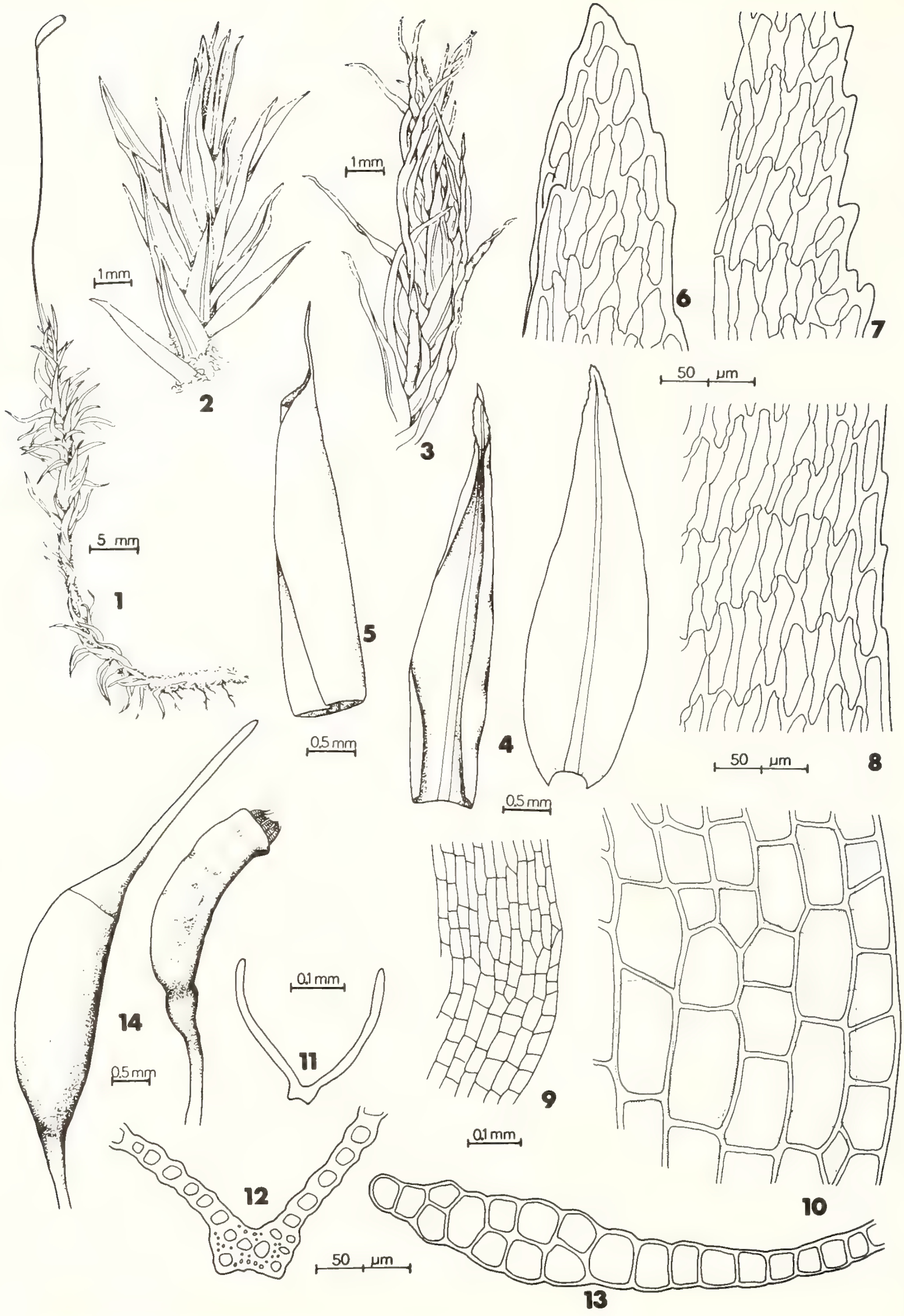
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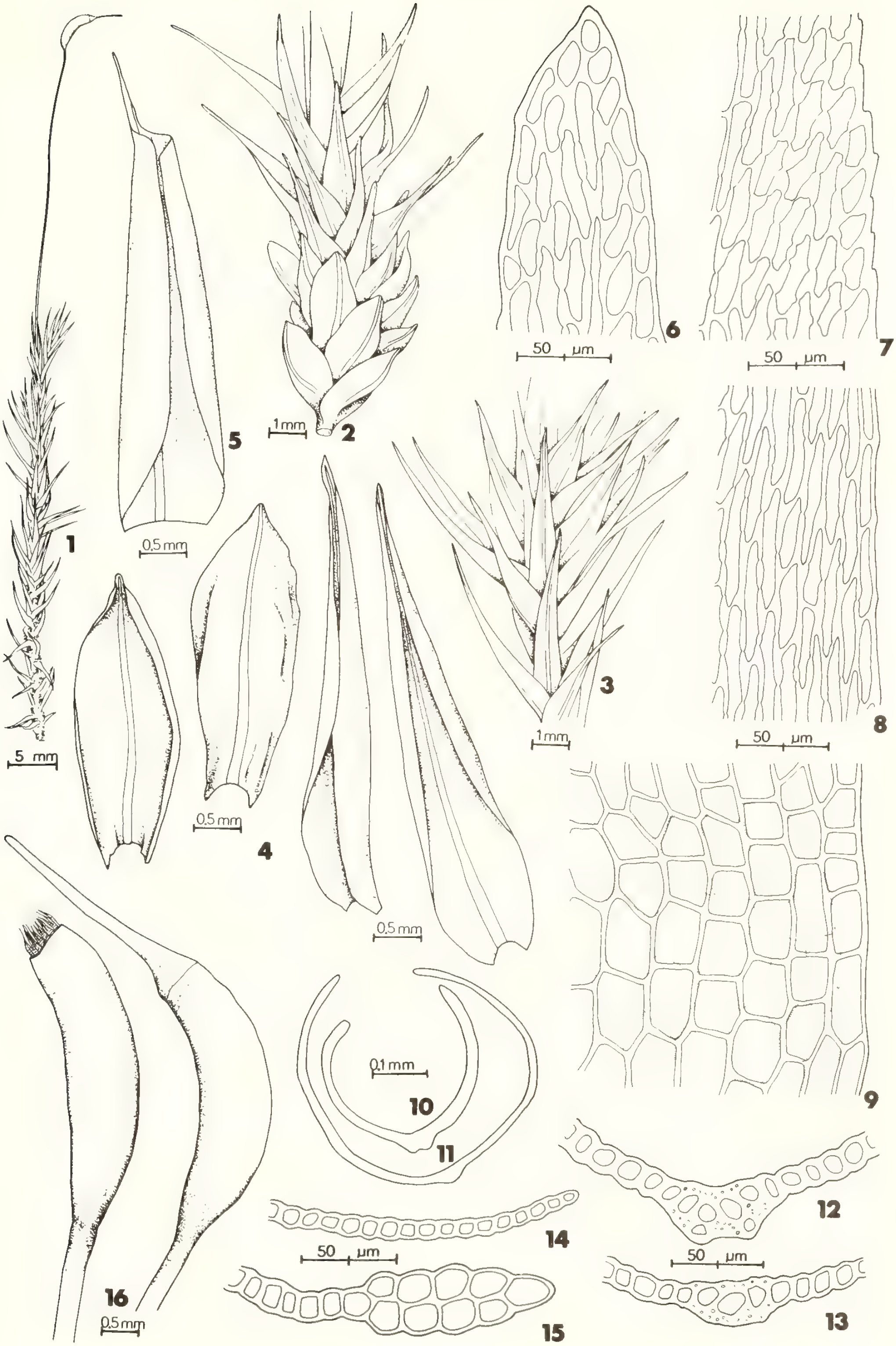
Plate 88. *Dicranum bonjeanii*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Perichaetial leaf. 6. Apex of leaf. 7–10. Leaf cells (7, apical. 8, median-marginal. 9–10, alar.). 11. Cross-section of leaf near middle. 12. Cross-section of costa near middle. 13. Cross-section of alar cells. 14. Capsules, operculate (wet), inoperculate (dry).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11
12
14
50 µm
50 µm
13
15
16
0,5 mm

Plate 89. *Dicranum leioneuron*. 1. Habit. 2. Portion of julaceous region of stem (wet). 3. Portion of stem (wet). 4. Leaves. 5. Perichaetial leaf. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf above middle. 11. Cross-section of leaf below middle. 12. Cross-section of costa near middle. 13. Cross-section of costa near base. 14. Cross-section of marginal cells below middle. 15. Cross-section of alar cells. 16. Capsules (wet).

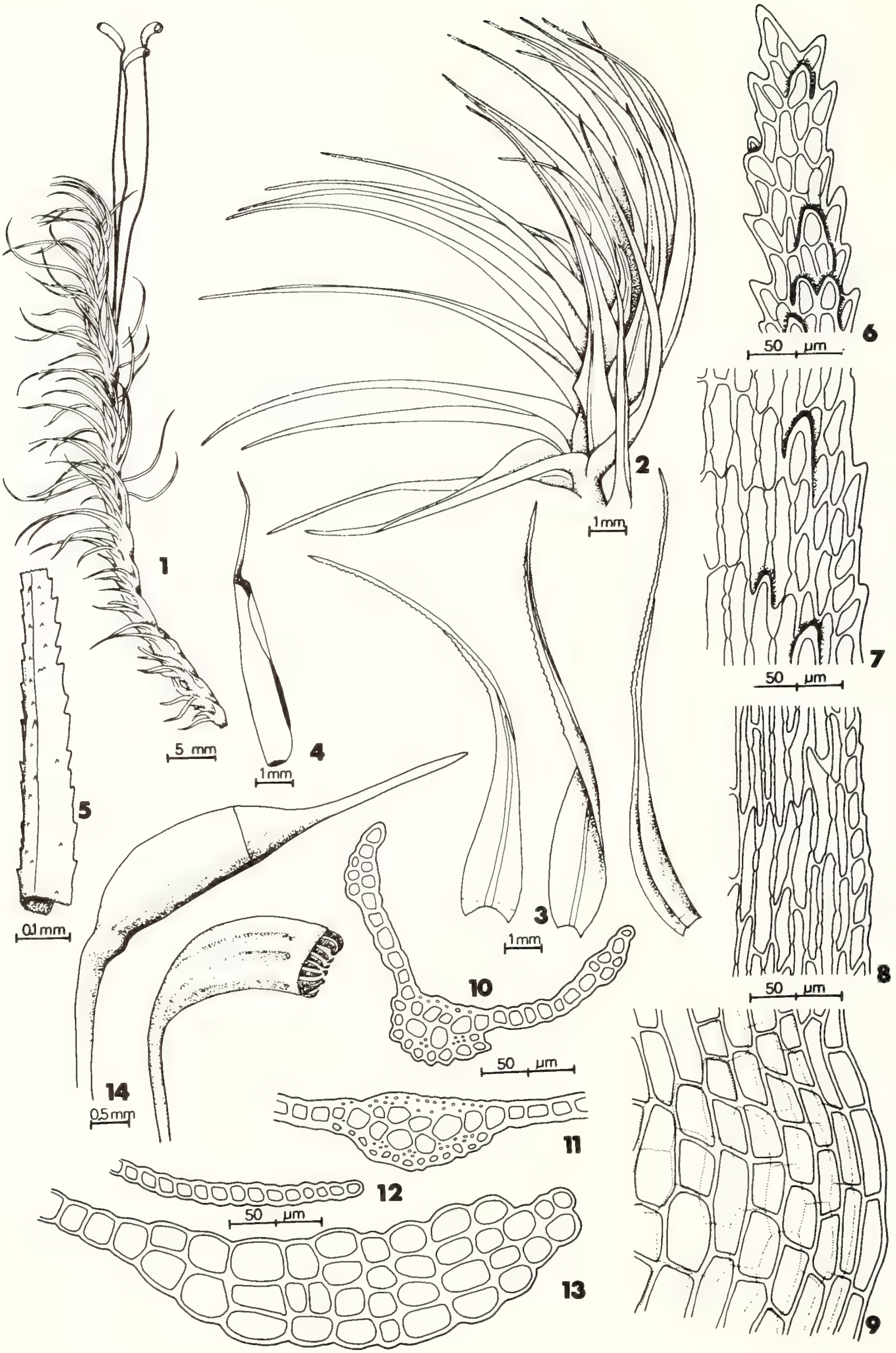
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Plate 90. *Dicranum majus*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Perichaetial leaf. 5. Dorsal-apical portion of leaf. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf above middle. 11. Cross-section of costa near base. 12. Cross-section of marginal cells near middle. 13. Cross-section of alar cells. 14. Capsules, operculate (wet), inoperculate (dry).

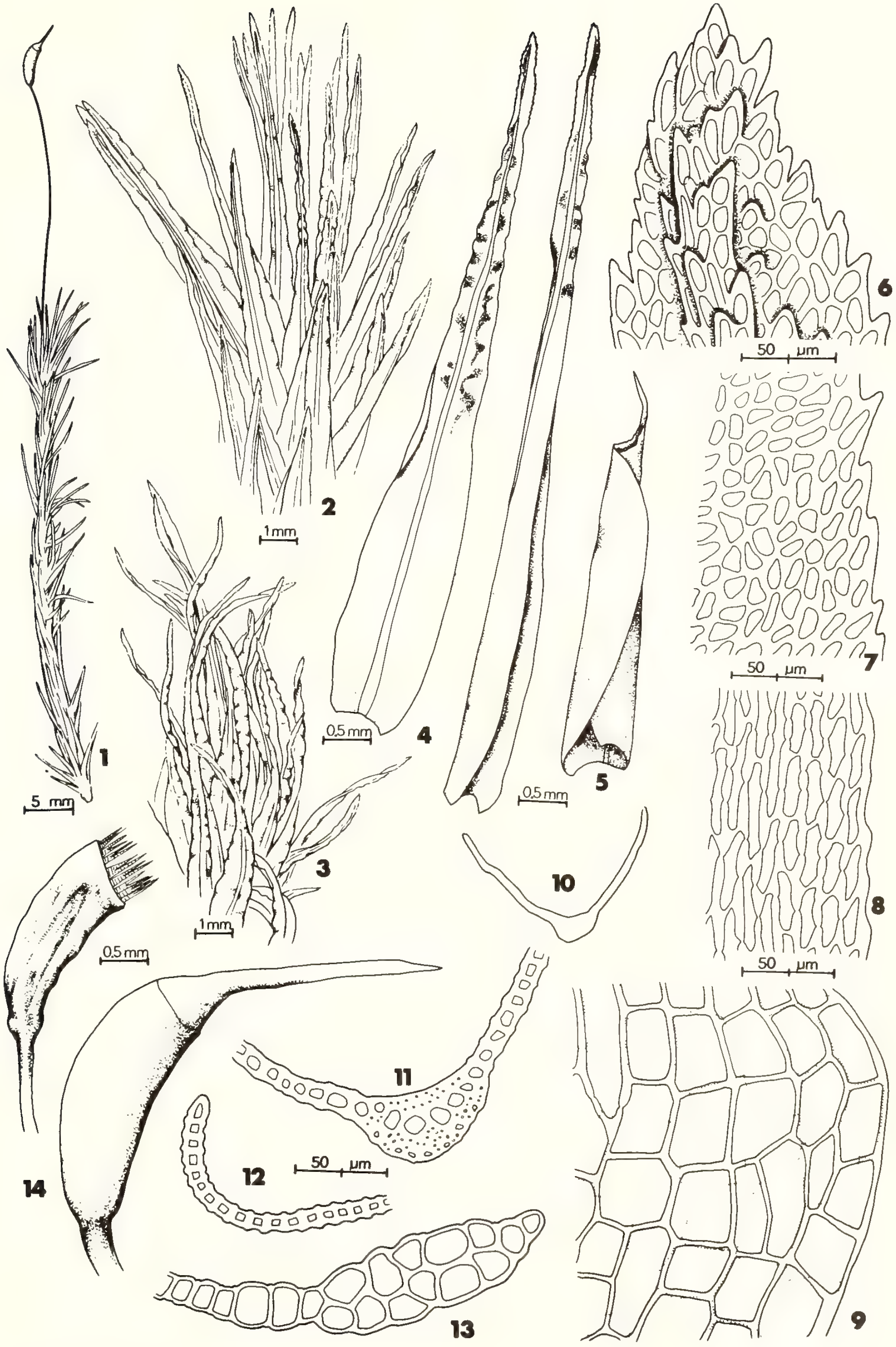
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Plate 91. *Dicranum undulatum*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Perichaetial leaf. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near middle. 11. Cross-section of costa near middle. 12. Cross-section of marginal cells near middle. 13. Cross-section of alar cells. 14. Capsules, operculate (wet), inoperculate (dry).

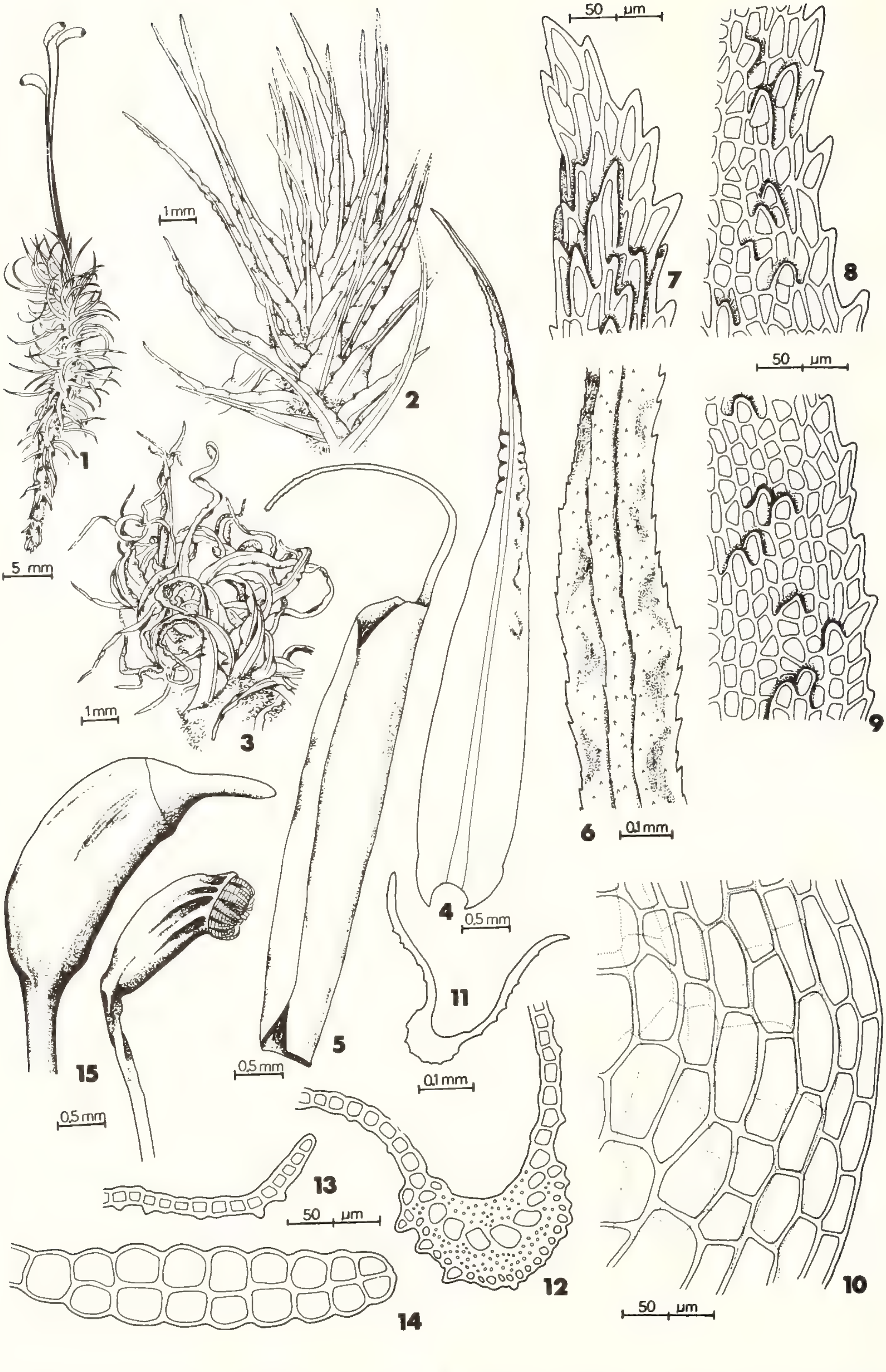
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Plate 92. *Dicranum ontariense*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaf. 5. Perichaetial leaf. 6. Dorsal-apical portion of leaf. 7. Apex of leaf. 8–10. Leaf cells (8, apical. 9, median-marginal. 10, alar.). 11. Cross-section of leaf above middle. 12. Cross-section of costa near middle. 13. Cross-section of marginal cells near middle. 14. Cross-section of alar cells. 15. Capsules, operculate (wet), inoperculate (dry).

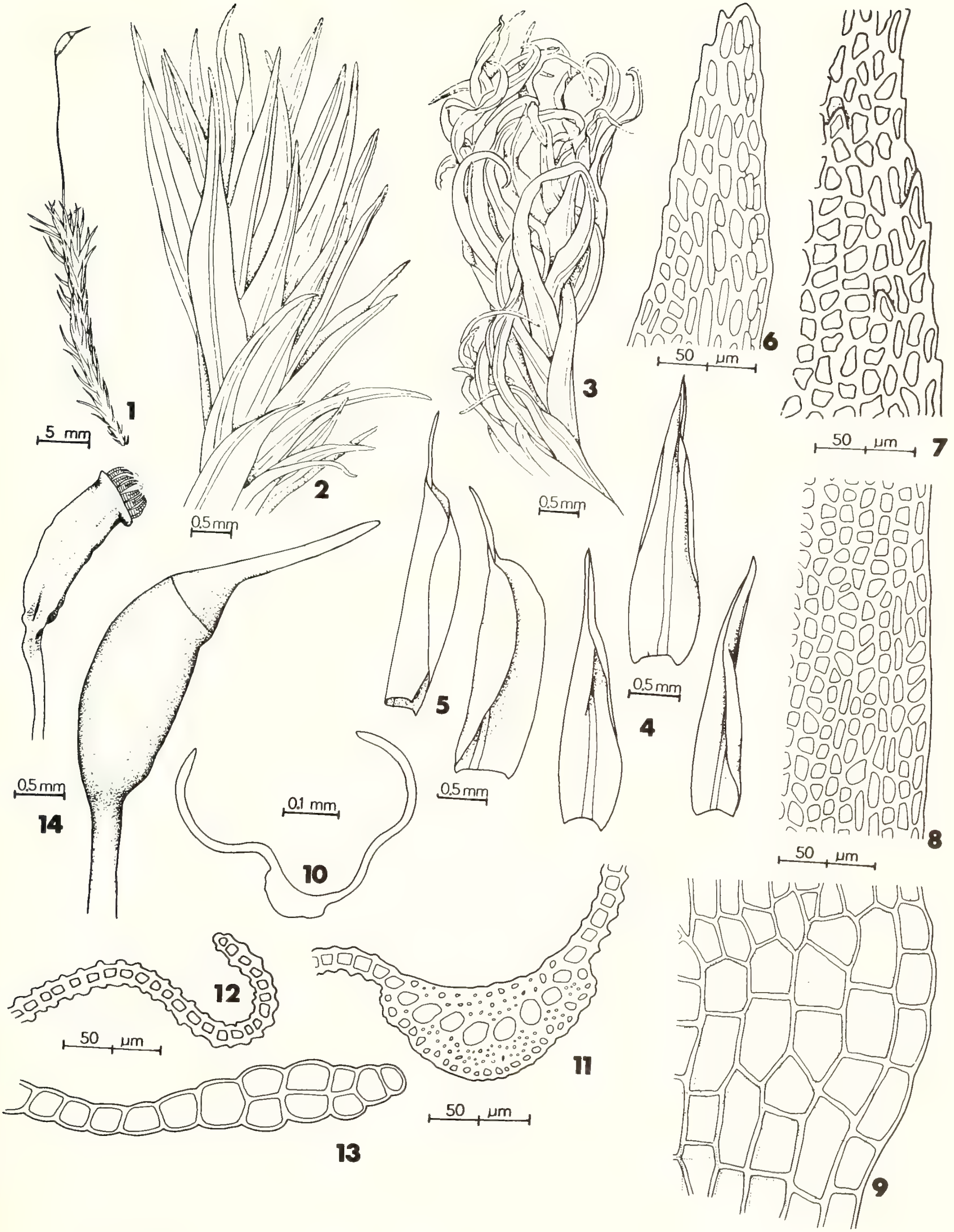
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Plate 93. *Dicranum condensatum*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Perichaetial leaves. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near middle. 11. Cross-section of costa near middle. 12. Cross-section of marginal cells near middle. 13. Cross-section of alar cells. 14. Capsules, operculate (wet), inoperculate (dry).

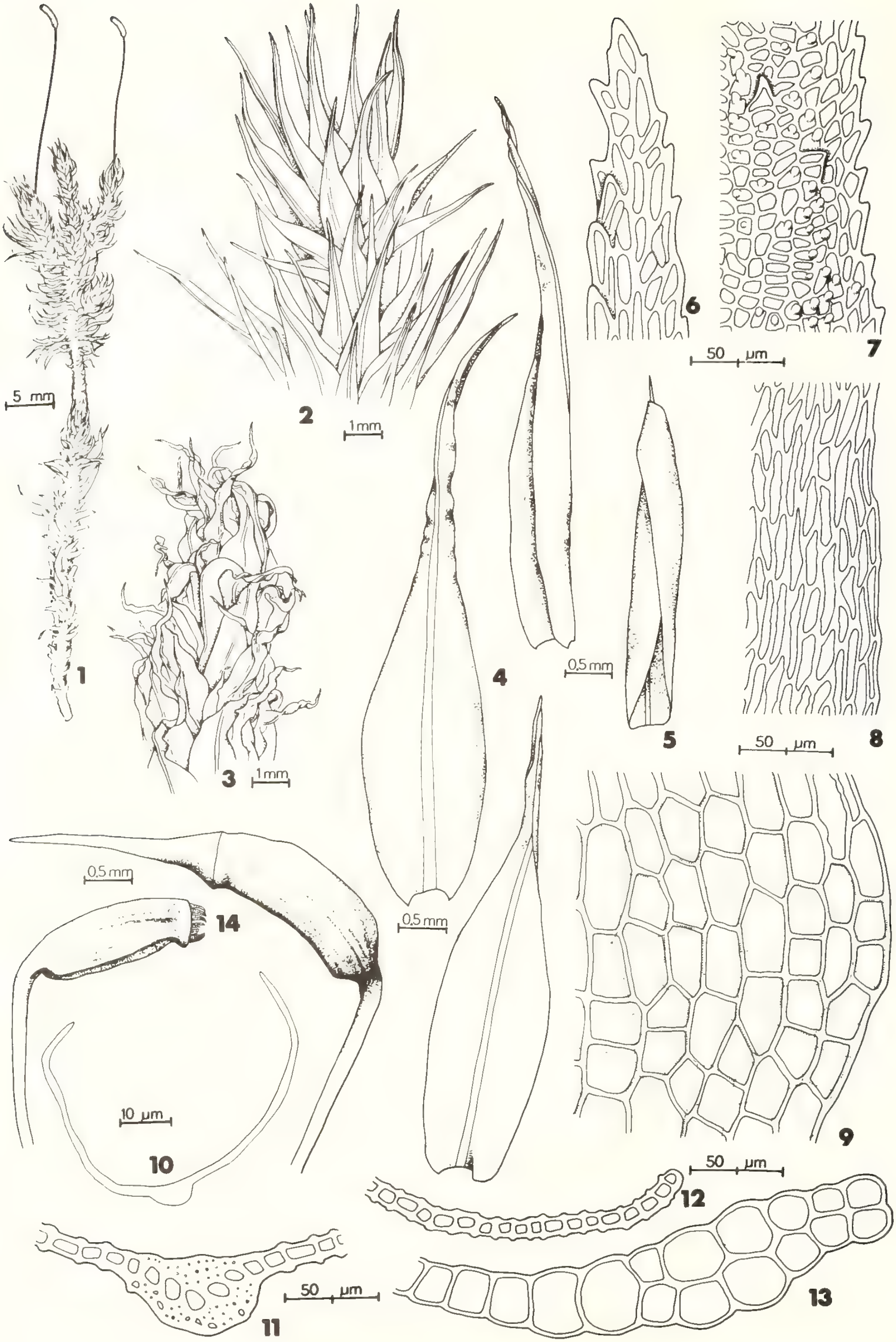
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Plate 94. *Dicranum spurium*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Perichaetial leaf. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near middle. 11. Cross-section of costa near middle. 12. Cross-section of marginal cells near middle. 13. Cross-section of alar cells. 14. Capsules, operculate (wet), inoperculate (dry).

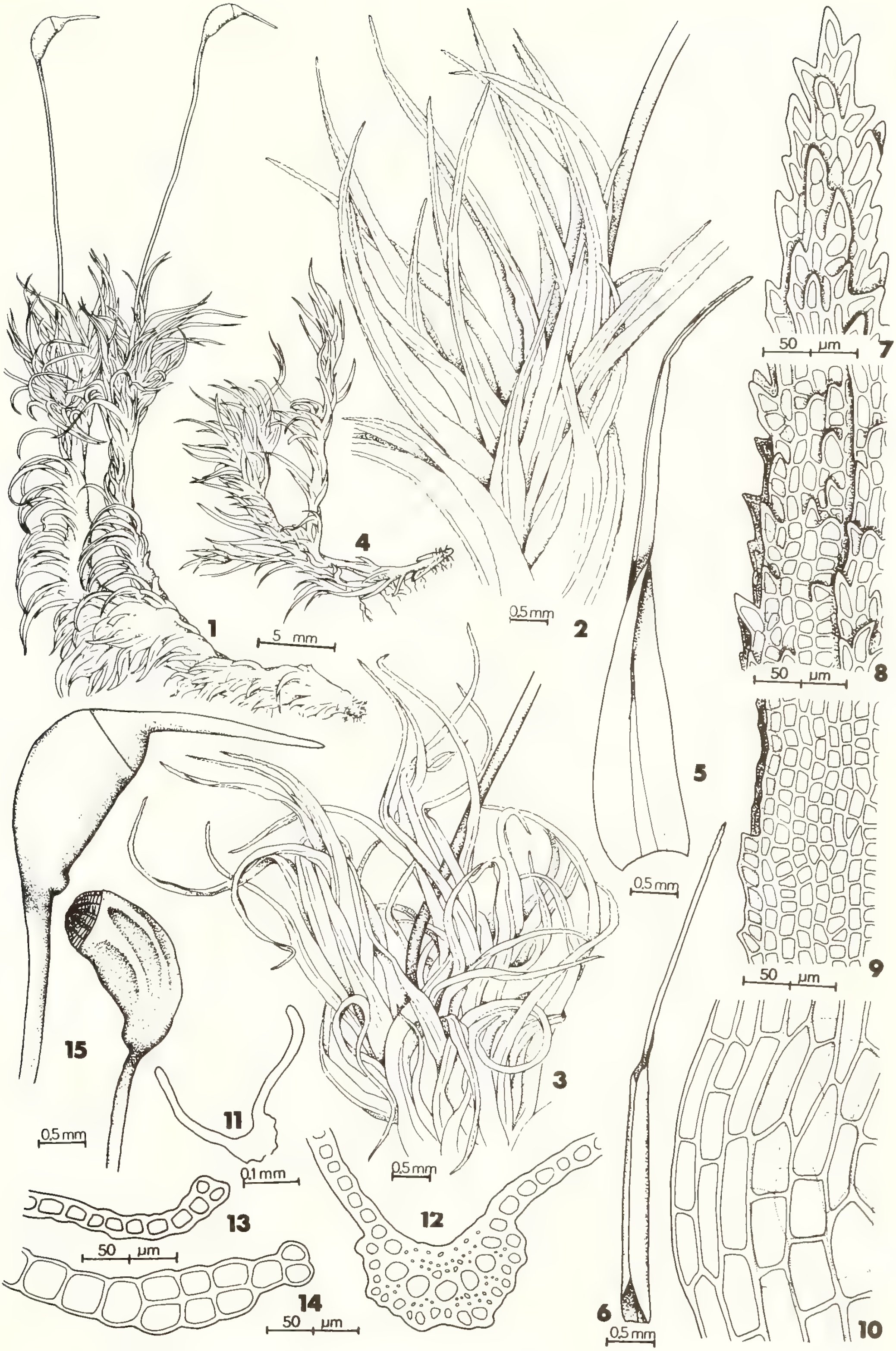

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Plate 95. *Dicranum fuscescens*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Male plant. 5. Leaf. 6. Perichaetial leaf. 7. Apex of leaf. 8–10. Leaf cells (8, apical. 9, median-marginal. 10, alar.). 11. Cross-section of leaf near middle. 12. Cross-section of costa near middle. 13. Cross-section of marginal cells above middle. 14. Cross-section of alar cells. 15. Capsules, operculate (wet), inoperculate (dry).

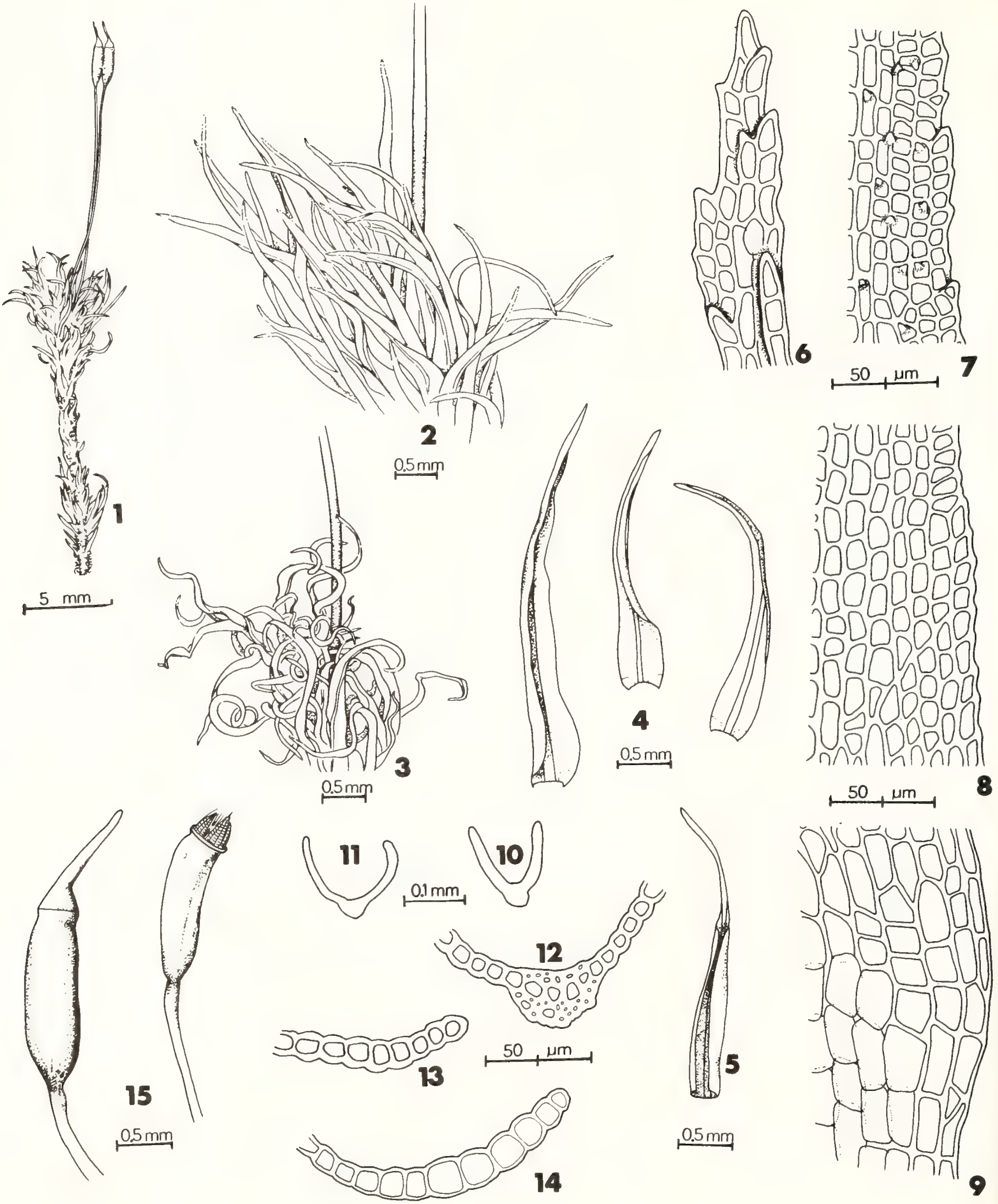
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Plate 96. *Dicranum montanum*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Perichaetial leaves. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf above middle. 11. Cross-section of leaf near middle. 12. Cross-section of costa near middle. 13. Cross-section of marginal cells near middle. 14. Cross-section of alar cells. 15. Capsules, operculate (wet), inoperculate (dry).

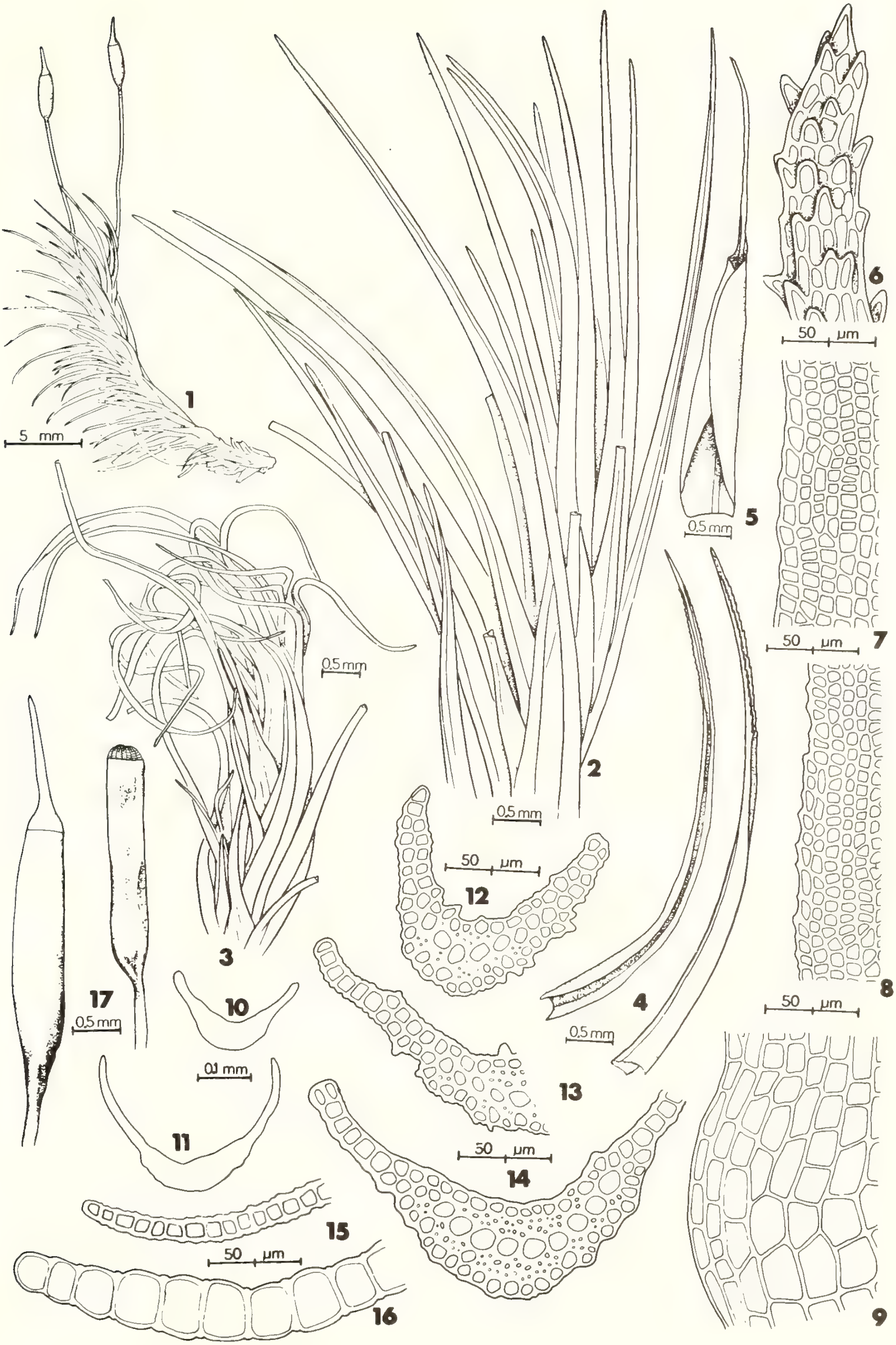
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Plate 97. *Dicranum fulvum*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Perichaetial leaf. 6. Apex of leaf. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near middle. 11. Cross-section of leaf near base. 12. Cross-section of leaf above middle. 13. Cross-section of marginal cells near middle. 14. Cross-section of leaf below middle. 15. Cross-section of marginal cells near base. 16. Cross-section of alar cells. 17. Capsules, operculate (wet), inoperculate (dry).

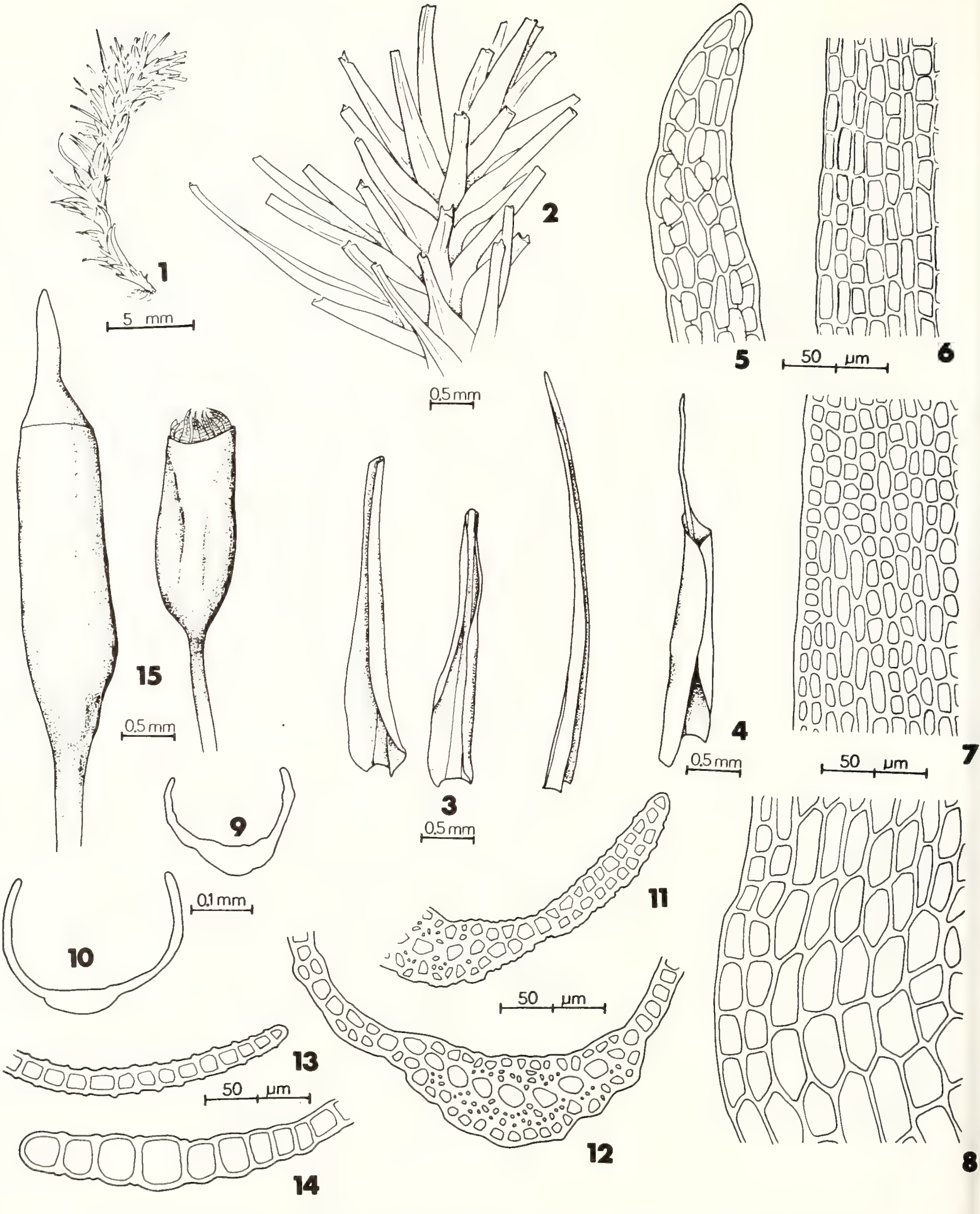
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Plate 98. *Dicranum viride*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Perichaetial leaf. 5. Apex of leaf. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near apex. 10. Cross-section of leaf near base. 11. Cross-section of marginal cells near apex. 12. Cross-section of costa near middle. 13. Cross-section of marginal cells near base. 14. Cross-section of alar cells. 15. Capsules, operculate (wet), inoperculate (dry).

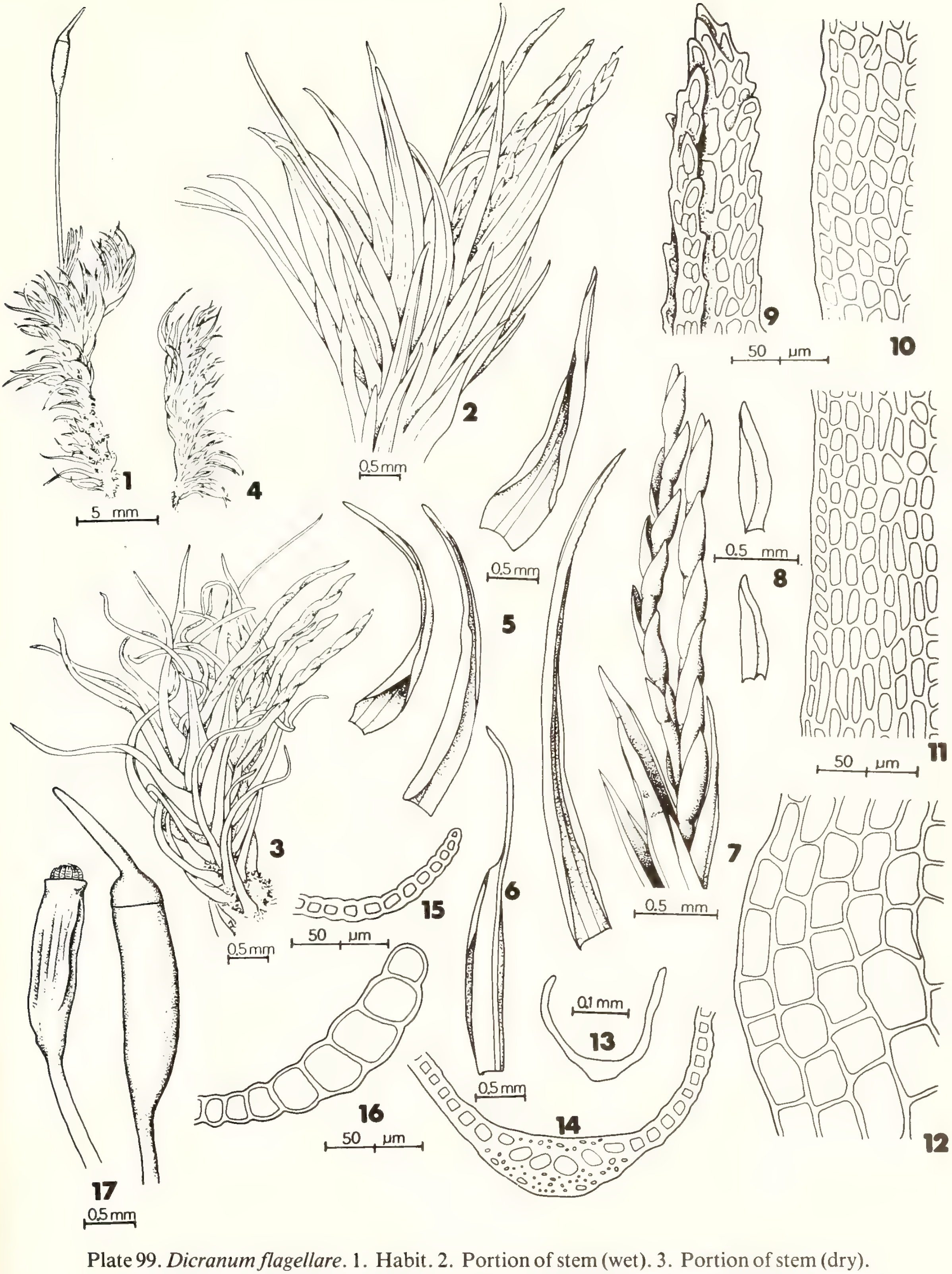
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Plate 99. *Dicranum flagellare*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Male plant. 5. Leaves. 6. Perichaetial leaf. 7. Flagella. 8. Leaves of flagella. 9. Apex of leaf. 10–12. Leaf cells (10, apical. 11, median-marginal. 12, alar.). 13. Cross-section of leaf near middle. 14. Cross-section of costa near base. 15. Cross-section of marginal cells near middle. 16. Cross-section of alar cells. 17. Capsules, operculate (wet), inoperculate (dry).

10. **Paraleucobryum** (Lindb. *ex* Limpr.) Loeske, Allg. Bot. Zeitschr. 13: 167. 1907.

Dicranum subg. *Paraleucobryum* Lindb. *ex* Limpr., Laubm. Deutschl. 1: 373. 1886.

Habit: In erect, loose to dense tufts.

Colour: Whitish green to grayish green, sometimes yellowish, often of a lighter colour at leaf bases.

Stems: 1-4 cm high, erect, simple or branched, rhizoids below apex among leaves.

Leaves: Spreading, falcate-secund, especially at tips of stems, rarely almost straight, little changed when dry, tubulose, lamina unistratose, subulate, acute, apices sometimes fragile and broken, nondecurrent. Perichaetial leaves with a broad base, clasping seta, abruptly narrowed to a long awn.

Leaf Margins: Plane or incurved, serrate to serrulate from apex to below leaf middle, serrulate to entire at base.

Costae: Single, covering ½-⅔ of leaf base and all of subula, percurrent, striate on the dorsal surface, the striae with teeth, lacking stereids, composed of 3-4 layers of large cells, hyaline, nonchlorophyllose cells intermingled with green, chlorophyllose cells.

Leaf Cells: Smooth, the walls of medium thickness, basal cells pitted. Median cells quadrate to rectangular, rib cells on dorsal surface of costa chlorophyllose, 1.5-4.0 times shorter than adjacent rows of nonchlorophyllose cells, alar cells inflated, brown, extending to costa.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, covering most of capsule, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown, reddish at base and around mouth, cylindric, straight, erect to somewhat inclined, smooth, irregularly furrowed when dry.

Setae: Straight to flexuose, smooth, twisted when dry, yellowish brown.

Annuli: Lacking.

Opercula: Rostrate, straight.

Peristomes: Single, consisting of 16, brown to reddish brown, lanceolate teeth, divided about halfway into 2 segments, papillose above, vertically to obliquely striate below.

Spores: Yellowish green to green, globose to ellipsoidal, minutely papillose, 23-33 μm in longest dimension.

1. **Paraleucobryum longifolium** (Hedw.) Loeske, Hedwigia 47: 171. 1908.
Dicranum longifolium Hedw., Spec. Musc. 130. 1801.
PLATE 100

A distinct moss for the following reasons: Plants whitish green to grayish green, leaves falcate-secund, subulate, 4-8 mm long, costae covering ½-⅔ of leaf base and all of upper part, striate on dorsal surface; capsules cylindric, straight, smooth, erect, 2-3 mm long, opercula long-rostrate, 1-2 mm long.

Habitat: Usually on soil over noncalcareous boulders and bluffs, sometimes on tree trunks, stumps, and logs.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Queen's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Halifax, Inverness, Kings, Victoria); Prince Edward Island (Kings, Queens).

Range: Labrador and Greenland, south in the mountains to North Carolina and Tennessee, west across the continent in the northern United States and southern Canada; extending from *Alaska to British Columbia on the West Coast; also known from Colorado and Arizona. Europe, *Asia.

Chromosome Number: n = 12.

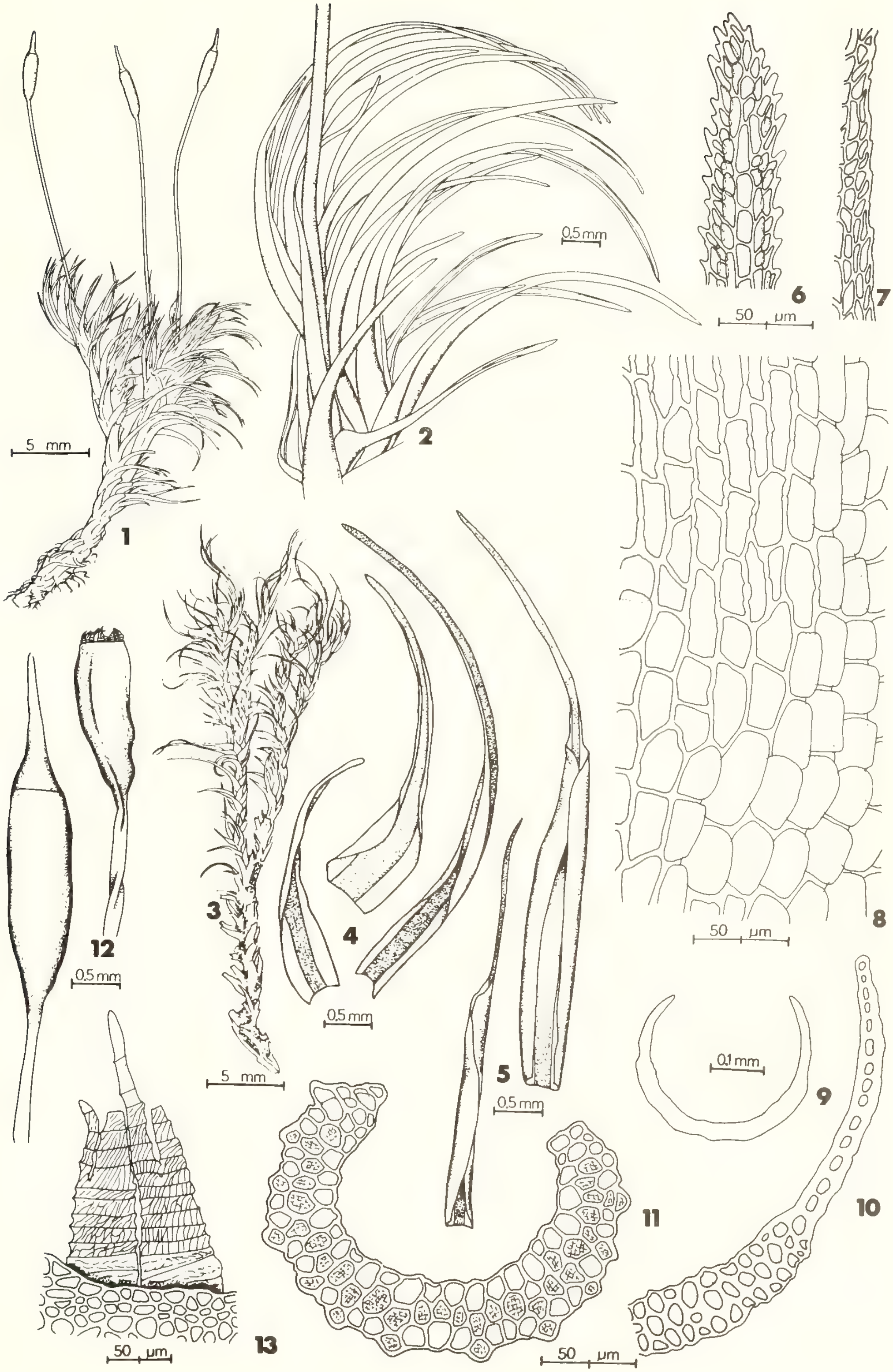

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Plate 100. *Paraleucobryum longifolium*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Perichaetial leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9–10. Cross-sections of leaves near base. 11. Cross-section of leaf near middle. 12. Capsules, operculate (wet), inoperculate (dry). 13. Peristome teeth.

Family LEUCOBRYACEAE

Leucobryum Hampe, Linnaea 13: 42. 1839.

Habit: In erect, dense, often rounded cushions.

Colour: Whitish green above, sometimes with a bluish or grayish tinge, the lower portion white or tan.

Stems: 2–10 cm high, erect, dichotomously branched, sometimes simple, rhizoids below.

Leaves: Erect-spreading, sometimes falcate-secund, little changed when dry, concave to tubulose, multistratose, oblong-lanceolate, acute to apiculate, nondecurrent. Perichaetial leaves scarcely differentiated, clasping base of seta.

Leaf Margins: Plane or incurved, serrulate at apex, unistratose.

Costae: Single, percurrent, covering most of leaf, not prominent on dorsal surface, in cross-section with a central row of small, quadrate, chlorophyllose cells (chlorocysts) and 1–4 rows of large, nonchlorophyllose cells (leucocysts) on both surfaces, each with a large pore.

Leaf Cells: Smooth, thin-walled, many cells with a large pore, the marginal cells with pitted walls. Median cells quadrate to rectangular, 4–8 rows of narrow, linear-flexuose cells on the margins.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Dwarf male plants growing on the leaves of the female plants. Perichaetia terminal.

Calyptrae: Cucullate, naked, whitish or yellowish with red tip, covering half of capsule, fugacious.

Capsules: Solitary or often two, on a seta arising from the stem apex, red to reddish brown, oblong-cylindric, arcuate, inclined to horizontal, plicate when dry, strumose.

Setae: Straight or flexuose, sometimes twisted when dry, reddish.

Annuli: Lacking.

Opercula: Long-rostrate, straight or arcuate.

Peristomes: Single, consisting of 16, dark red teeth, divided about halfway into 2 segments, vertically striate below, papillose above.

Spores: Yellowish or brownish, ovoid to globose, minutely papillose, 14–20 μm.

1. **Leucobryum glaucum** (Hedw.) Ångstr. *ex* Fries, Summ. Veg. Scand. 1: 94. 1846.

Dicranum glaucum Hedw., Spec. Musc. 135. 1801.

PLATE 101

Plants erect, whitish green, often in dense, rounded cushions, stems 2–10 cm high; leaves erect-spreading, sometimes falcate-secund, little changed when dry, oblong-lanceolate, acute to apiculate, concave to tubulose, up to 9 mm long, 2 mm wide, costae occupying most of laminae; dioicous, male plants dwarfed, growing on leaves of female plants, capsules 1–2 from stem apex, oblong-cylindric, arcuate, inclined to horizontal, plicate when dry, strumose, on long setae.

Habitat: On moist soil or humus, frequently on slopes in woods, occasionally in swampy woods or woods beside lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Saint John); Nova Scotia (Annapolis, Antigonish, Colchester, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth, Sable Island); Prince Edward Island (Queens).

Range: Newfoundland to Manitoba, south to Florida, Mississippi, Louisiana, and Oklahoma; also in *British Columbia (?). West Indies, Europe, *Asia, *Africa.

Chromosome Number: n = 11, 14.

Remarks: The whitish green plants, growing in dense, rounded cushions, make this an easily recognized plant. The plants rarely produce sporophytes and only five collections have been seen from the Maritimes with capsules.

Leucobryum is commonly called the "Pin Cushion Moss" alluding to its dense, rounded cushions. In parts of Quebec it is sometimes referred to as "Coussin de belle-mère" (Mother-in-law Cushion). It is jokingly called this because if you are out for a walk in the woods with your mother-in-law you should invite her to sit down to rest on a cushion of *Leucobryum* which has a dry appearance but frequently contains great quantities of water.

Cushions of *Leucobryum* are sometimes used in indoor floral displays.

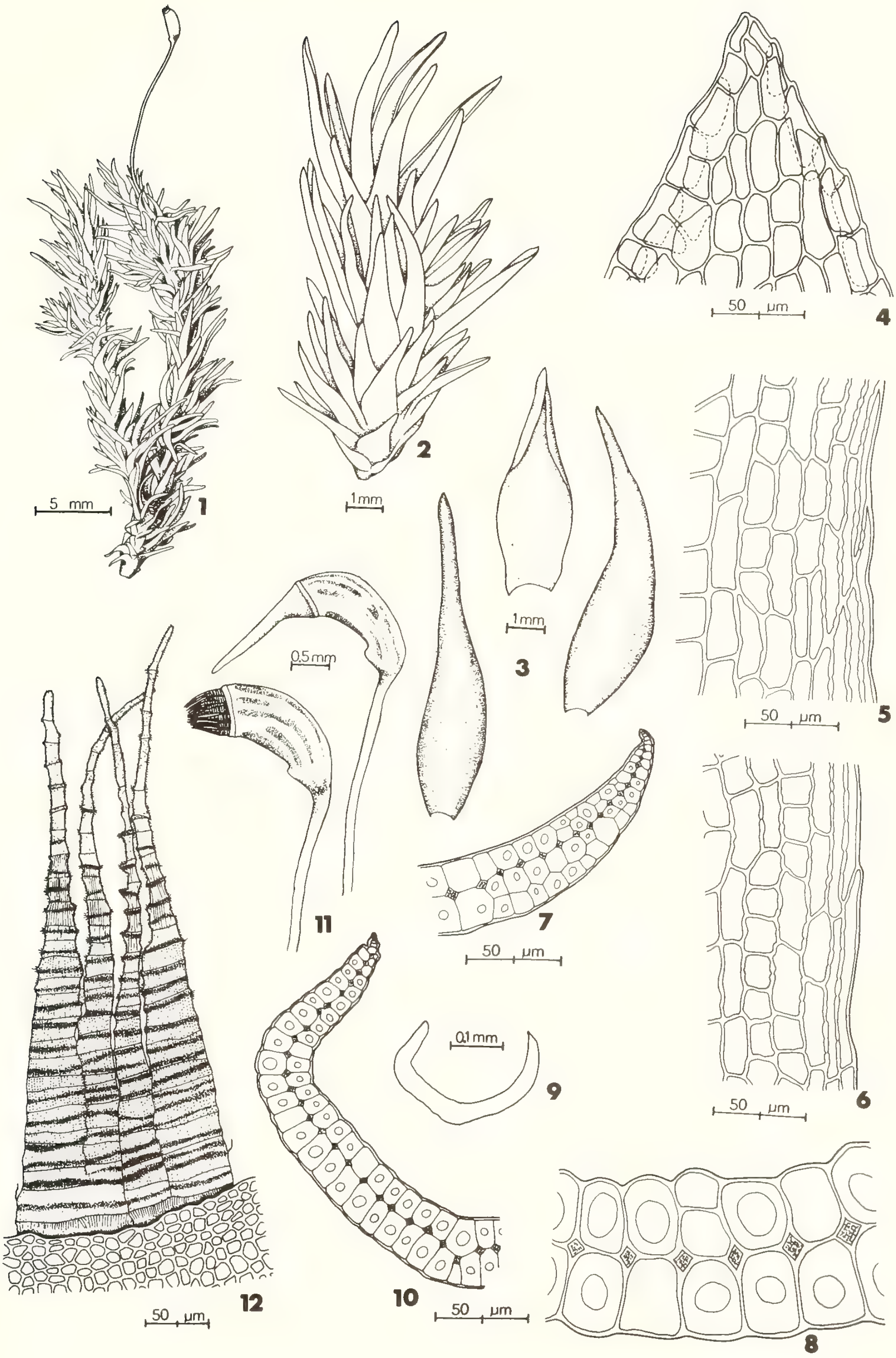
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Plate 101. *Leucobryum glaucum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Cross-section of leaf margins near apex. 8. Cross-section of leaf near apex. 9. Cross-sections of leaves near middle. 10. Cross-section of leaf margin near middle. 11. Capsules (dry). 12. Peristome teeth.

Family ENCALYPTACEAE

Encalypta Hedw., Spec. Musc. 60. 1801.

Habit: In erect, loose to dense tufts.
Colour: Glaucous green to brownish green above, brownish green to brown below.
Stems: 0.5–2.0 cm high, erect, simple or dichotomously branched, rhizoids below.
Leaves: Erect-spreading, contorted when dry, concave to keeled, lamina unistratose, elliptic to oblong-obovate, obtuse to acute, often mucronate or apiculate, sometimes cucullate, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane or weakly recurved below the middle, papillose-crenulate above, entire or nearly so below.
Costae: Single, ending below apex to shortly excurrent, prominent on dorsal surface of leaf, yellowish to reddish, smooth or papillose on dorsal surface.
Leaf Cells: Densely multipapillose with forked papillae on both surfaces in the upper part of the leaves, few or no papillae below, the walls thick or of medium thickness above, becoming thin-walled below, lacking pits. Median cells hexagonal or irregularly angled, becoming long and rectangular near base.
Asexual Reproductive Bodies: Present or lacking. Filiform, multicellular, branched, brownish green gemmae with papillose cells often present on the stems in the leaf axils.
Sex: Autoicous. Perichaetia terminal, perigonial buds just below.
Calyptrae: Mitrate, naked or papillose near apex, fringed at base, yellowish, covering entire capsule.
Capsules: Solitary, on a seta arising from stem apex, light brown to reddish brown, cylindric, straight, erect, smooth or spirally ribbed when dry.
Setae: Straight or somewhat flexuose, smooth, twisted when dry, yellow or brown.
Annuli: 1–2 rows of cells, deciduous.
Opercula: Long-rostrate, straight.
Peristomes: Single or double, consisting of 16, dark red, papillose teeth, narrowly lanceolate to filiform, entire or divided, endostome segments pale, often adherent to teeth.
Spores: Yellow to brownish yellow, globose, smooth, papillose or wrinkled, 16–36 μm.

The name "Extinguisher Moss" is commonly applied to *Encalypta* because of the resemblance of the large, mitrate calyptra to a candle-snuffer.

1. Plants small, stems seldom reaching 1 cm high, lacking gemmae; leaves often apiculate, costae smooth on dorsal surface; sporophytes frequently present, capsules smooth when dry .... 1. *E. ciliata*
1. Plants large, stems often 1 cm high or more, gemmae usually present; leaves obtuse to broadly acute, costae papillose on dorsal surface; sporophytes not known from the Maritimes, capsules spirally ribbed when dry .... 2. *E. procera*

1. Encalypta ciliata Hedw., Spec. Musc. 61. 1801.
PLATE 102

Plants small, stems 5–10 (rarely 15) mm high, leaves glaucous green to brownish green, erect-spreading, contorted when dry, elliptic to oblong-obovate, acute to apiculate, 2–4 mm long, margins entire, costae percurrent to shortly excurrent, smooth on dorsal surface; sporophytes abundant, setae 4–10 mm long, urn smooth, calyptrae fringed at base, peristome single, spores wrinkled-reticulate, 26–36 μm.

Habitat: On ledges or in crevices of calcareous bluffs or cliffs, sometimes on soil over boulders.

Maritime Distribution: Frequent. New Brunswick (Madawaska, Queen's, Victoria); Nova Scotia (Cape Breton, Cumberland, Kings, Victoria).

Range: In eastern North America from Labrador to Ontario, south to *Pennsylvania, Michigan, Wisconsin, Iowa; in western North America from Alaska to Alberta, south to California, Arizona, and *New Mexico. *Central and *South America, Europe, Asia, *Africa, *Australia.

Chromosome Number: n = 13.

2. Encalypta procera Bruch, Abh. Math. Phys. Cl. K. Bayer. Ak. Wiss. München 1: 283. 11. 1832.
[Synonym: *E. streptocarpa auct. non* Hedw.]
PLATE 103

Plants large, stems 10–20 mm high, usually bearing numerous, brownish green, filiform, multicellular, branched gemmae with papillose cells in the leaf axils, leaves glaucous green to brownish green, erect-spreading, contorted when dry, elliptic to oblong-obovate, obtuse to broadly acute, 2–4 mm long, margins entire, costae subpercurrent to percurrent, papillose on dorsal surface; sex organs and sporophytes unknown on Maritime plants, reported as autoicous, upper leaves of fruiting plants awned, setae 11–17 mm long, urn spirally ribbed, calyptrae lacerate-fringed, peristome double, spores finely papillose, 16–26 μm.

Habitat: On ledges or in crevices of calcareous cliffs, sometimes on soil over boulders.

Maritime Distribution: Frequent. New Brunswick (Albert, Victoria); Nova Scotia (Inverness, Kings, Victoria).

Range: Greenland to Alaska, south to *North Carolina, *Ohio, South Dakota, Montana, and Washington. Europe, *Asia, *South America.

Chromosome Number: n = 27.

Remarks: Illustrations of sporophytes from Ontario plants.

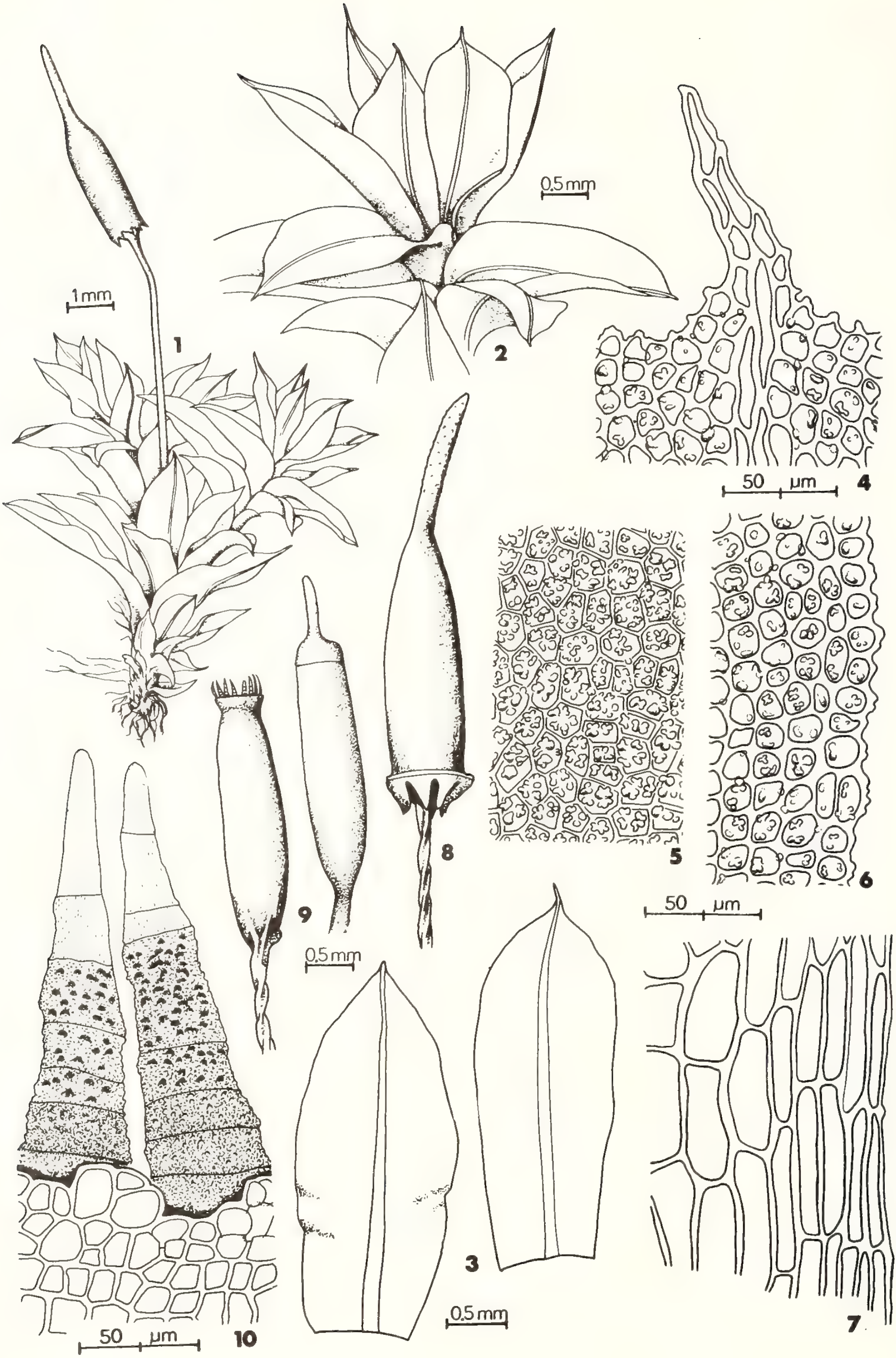
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Plate 102. *Encalypta ciliata*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Calyptrate capsule. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

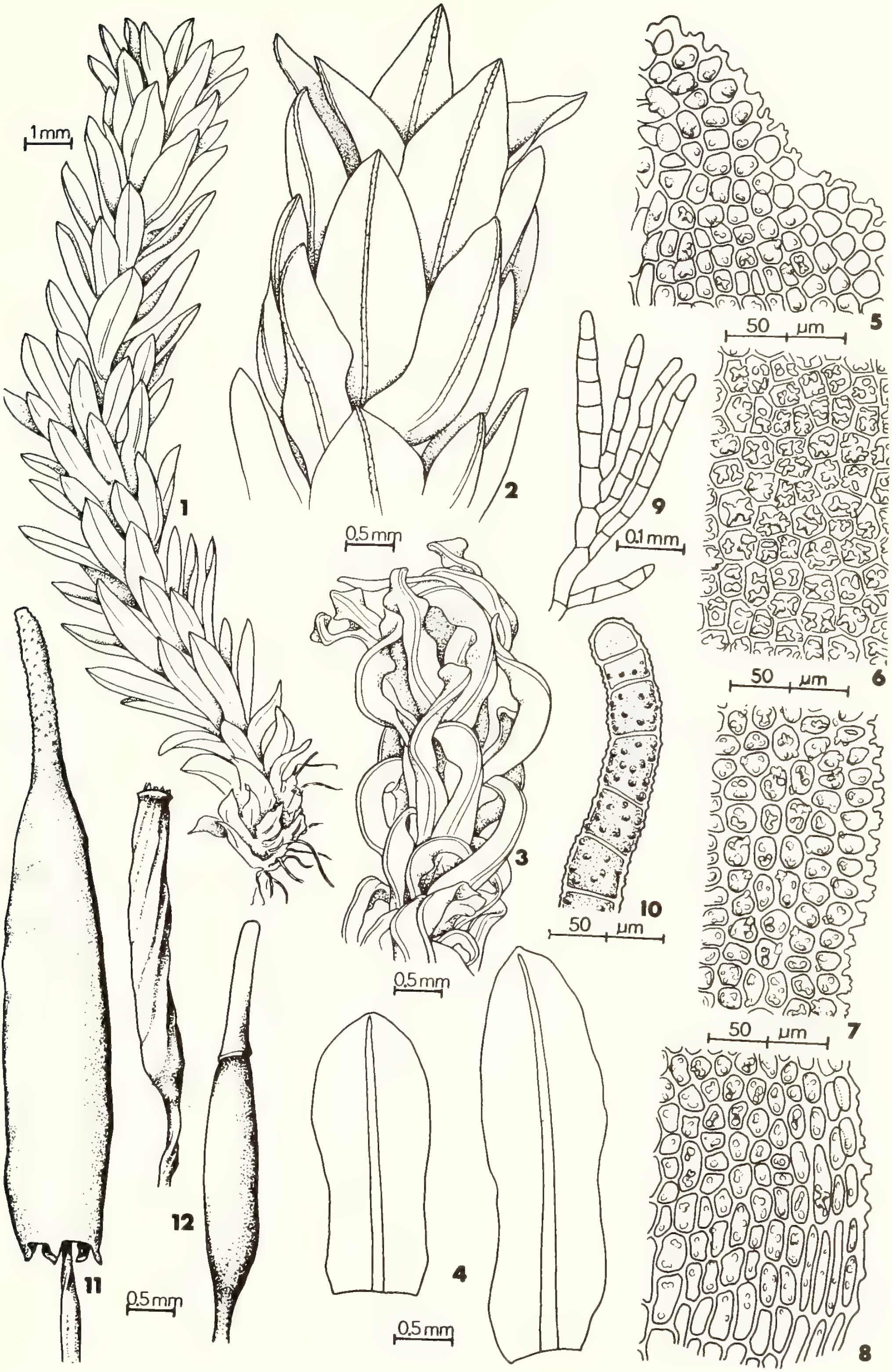
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Plate 103. *Encalypta procera*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Gemmae. 10. Enlargement of portion of gemma. 11. Calyptrate capsule. 12. Capsules, operculate (wet), inoperculate (dry).

1. Leaves with cylindrical filaments on ventral surface .... 10. *Aloina* (p. 229)
1. Leaves lacking filaments on ventral surface 2
  2. Capsules immersed; peristome lacking 3
    3. Leaves subtubulose above when dry; capsules with operculum .... 2. *Astomum* (p. 206)
    3. Leaves weakly keeled when dry; capsules lacking operculum ... 9. *Phascum* (p. 227)
  2. Capsules exserted; peristome present or lacking 4
    4. Basal cells of leaves hyaline and elongate, extending up margins as a V-shaped border .... 5. *Tortella* (p. 213)
    4. Basal cells of leaves not forming V-shaped border 5
      5. Leaf margins involute 6
        6. Gemmae on ventral surface of costae; plants always sterile; on tree trunks .... 13. *Tortula* (in part) (p. 239)
        6. Gemmae lacking; plants usually with sporophytes; plants on soil or in rock crevices .... 3. *Weissia* (p. 208)
      5. Leaf margins not involute 7
        7. Leaf margins plane or narrowly and indistinctly recurved 8
          8. Leaf cells smooth .... 11. *Pottia* (p. 231)
          8. Leaf cells papillose 9
            9. Plants in compact tufts; leaves glossy, apices nearly always intact; sporophytes often present, capsules lacking peristome .... 1. *Gymnostomum* (p. 202)
            9. Plants in loose tufts; leaves dull, apices often deciduous; sporophytes unknown on Maritime plants but capsules when present with peristomes .... 4. *Oxystegus* (p. 211)
        7. Leaf margins recurved 10
          10. Basal leaf cells subquadrate to short-rectangular, not enlarged ... 11
            11. Peristome teeth long and twisted .... 8. *Barbula* (p. 222)
            11. Peristome teeth short and not twisted .... 7. *Didymodon* (p. 220)
          10. Basal leaf cells long-rectangular, much enlarged 12
            12. Leaves with a long, often toothed, awn; peristome teeth long and twisted .... 13. *Tortula* (in part) (p. 239)
            12. Leaves lacking awn; peristome teeth short or lacking 13
              13. Costae with stereid cells above and below guide cells; plants noticeably reddish below; peristome present .... 6. *Bryoerythrophyllum* (p. 218)
              13. Costae with stereid cells only below guide cells; plants yellow or brown below; peristome present or lacking .... 12. *Desmatodon* (p. 233)

1. **Gymnostomum** Nees & Hornsch., Bryol. Germ. 1: 153. 1823. *nom. cons.*

Habit: In erect, dense tufts.

Colour: Green or yellowish green above, yellowish brown to reddish brown below with reddish rhizoids.

Stems: 0.5–4.0 cm high, erect, usually branched, rhizoids below, smooth or rarely papillose.

Leaves: Erect-spreading to nearly squarrose, contorted when dry, concave to keeled, unistratose, linear-lanceolate to ligulate, acute to obtuse, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or recurved below on one or both sides, papillose at apex to below leaf middle, entire or nearly so below.

Costae: Single, ending a few cells below apex to percurrent, scarcely prominent on dorsal surface, sometimes orange or red in colour.

Leaf Cells: Densely multipapillose on both surfaces in upper part of leaves, few or no papillae on basal cells, the walls thin or of medium thickness, lacking pits. Median cells rounded-hexagonal, sometimes quadrate or rectangular, rectangular and much longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, extending to base of capsule.

Capsules: Solitary, on a seta arising from stem apex, light brown to reddish brown, often shiny, oblong-cylindric or obovoid, straight, erect, smooth or somewhat wrinkled when dry.

Setae: Straight to flexuose, smooth, twisted when dry, yellow or reddish brown.

Annuli: Lacking.

Opercula: Long-rostrate, arcuate.

Peristomes: Lacking.

Spores: Yellowish green to brownish green, globose to ovoid, papillose, 9–24 μm in longest dimension.

1. Leaf margins plane; upper leaf cells indistinct, averaging less than 12 μm in longest dimension; capsules light brown; opercula deciduous; spores 9–14 μm in longest dimension . . . . 1. *G. aeruginosum*
1. Leaf margins recurved below on one or both sides; upper leaf cells clear, usually averaging more than 12 μm in longest dimension; capsules dark brown to reddish brown; opercula persistent, often remaining attached to the columella (systylius); spores 16–24 μm in longest dimension 2
    2. Stems smooth . . . . 2. *G. recurvirostrum*
    2. Stems papillose . . . . 2a. *G. recurvirostrum* var. *latifolium*

1. Gymnostomum aeruginosum Sm., Fl. Brit. 3: 1163. 1804.
[Synonym: *G. rupestre* Schleich. *ex* Schwaegr.]
PLATE 104

Leaves with plane margins, upper cells indistinct, 9–14 μm in longest dimension; capsules light brown, opercula deciduous, spores 9–14 μm in longest dimension.

Habitat: On calcareous rock, often on shaded cliff or in crevices, occasionally on boulders or on limy soil.

Maritime Distribution: Common. New Brunswick (Albert, Restigouche, Victoria); Nova Scotia (Cape Breton, Colchester, Cumberland, Hants, Inverness, Kings, Victoria); Prince Edward Island (Kings).

Range: Newfoundland to Alaska, south to North Carolina, Tennessee, Arkansas, Colorado, Arizona, and California. Central America, Europe, *Asia, *Africa.

Chromosome Number: n = 13.

2. Gymnostomum recurvirostrum Hedw., Spec. Musc. 33. 1801.
[Synonyms: *Hymenostylium curvirostre* Mitt.; *H. recurvirostre* (Hedw.) Dix.]
PLATE 105

Leaves with margins recurved below on one or both sides, upper cells clear, 9–24 μm in longest dimension; capsules dark brown to reddish brown, opercula persistent, systylius, spores 16–24 μm in longest dimension.

Habitat: On calcareous rock, especially on shaded cliff ledges or in crevices, sometimes on boulders.

Maritime Distribution: Frequent. New Brunswick (Albert, Victoria); Nova Scotia (Colchester, Hants, Inverness, Victoria).

Range: Greenland to Alaska, south to Tennessee, Indiana, Illinois, Arkansas, Texas, Colorado, Arizona, and Washington. Central and *South America, West Indies, Europe, Asia, *Africa.

Chromosome Number: n = 13.

2a. Gymnostomum recurvirostrum var. **latifolium** (Zett.) Flow. *ex* Crum, Bryologist 72(2): 243. 1969.
Gymnostomum rupestre var. *latifolium* Zett., K. Svenske Vet. Ak. Handl. 13(13): 11. 1876.
[Synonym: *G. recurvirostrum* var. *scabrum* (Lindb.) Grout]
PLATE 105

Plants similar to var. *recurvirostrum* but with papillae present on the stems.

Habitat: On soil over calcareous rock outcrops.

Maritime Distribution: Rare. New Brunswick (Albert). Known only from a single collection from Fundy National Park *(Ireland 11448).*

Range: Known in North America from New Brunswick, Ontario, Minnesota, Wisconsin, Illinois, Vermont, Virginia, Missouri, and Arkansas. Europe, *Asia.

Chromosome Number: Unreported.

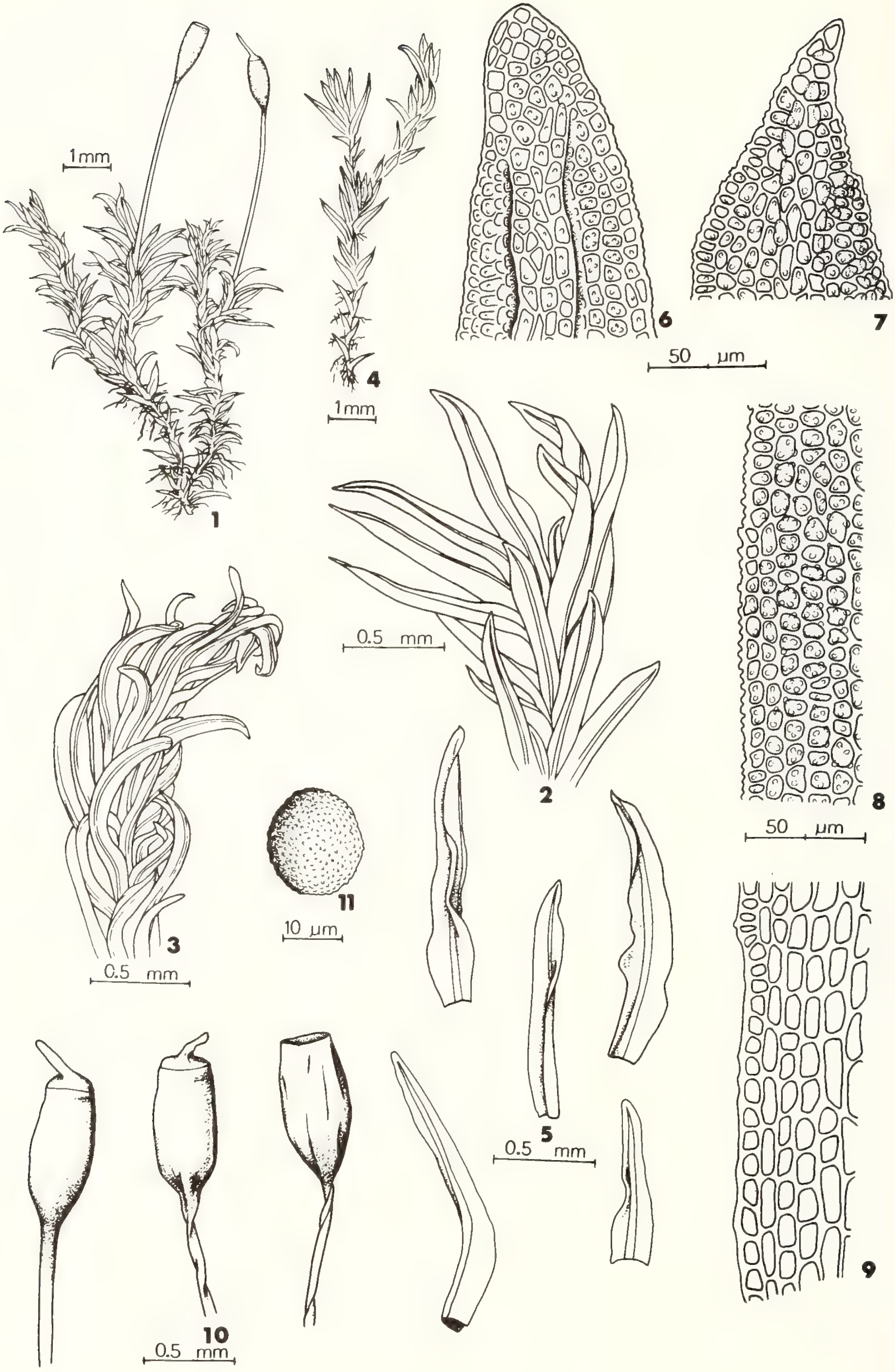
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Plate 104. *Gymnostomum aeruginosum*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Male plant. 5. Leaves. 6–9. Leaf cells (6–7, apical. 8, median-marginal. 9, alar.). 10. Capsules (wet on left). 11. Spore.

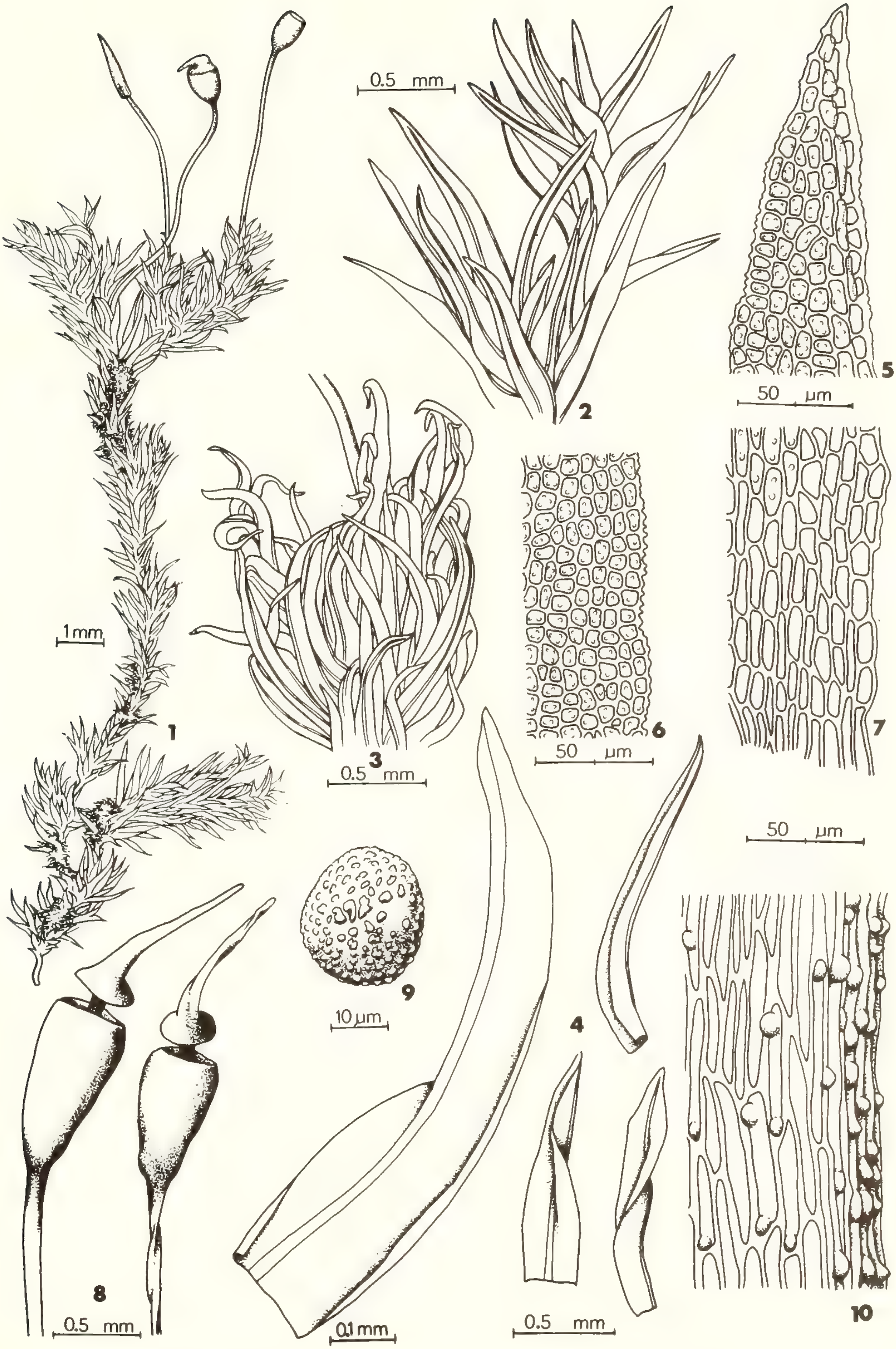
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Plate 105. *Gymnostomum recurvirostrum*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (wet on left). 9. Spore. 10. *Gymnostomum recurvirostrum* var. *latifolium*, stem surface.

2. **Astomum** Hampe, Flora 20: 285. 1837.

Habit: Erect, loosely to densely gregarious.
Colour: Yellowish green to dull green, becoming brownish green with age.
Stems: 3–5 mm high, erect, simple or branching, rhizoids at base.
Leaves: Erect-spreading, straight to somewhat curved, crisped when dry, subtubulose above, lamina unistratose, lanceolate to linear-lanceolate, apex mucronate, base broad, subsheathing, nondecurrent. Perichaetial leaves longer, wider, and sheathing capsule.
Leaf Margins: Plane below, involute to subtubulose above, entire.
Costae: Single, excurrent into a short mucro, filling ⅕–⅛ the base.
Leaf Cells: Densely multipapillose on both surfaces in upper part of leaves, few or no papillae on basal cells, the walls thin, lacking pits. Median cells quadrate, rectangular or hexagonal, basal cells rectangular and much longer.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous. Perigonial buds at base of stem.
Calyptrae: Cucullate, naked, yellowish with a darker tip, covering operculum and a small portion of capsule.
Capsules: Solitary, immersed, on a short seta arising from stem apex, yellowish green or brownish green, globose to ovoid, straight, erect, smooth.
Setae: Short, straight, smooth, not twisted, yellow.
Annuli: Lacking.
Opercula: Rostellate, sometimes obliquely rostellate.
Peristomes: Lacking.
Spores: Yellowish brown, globose to ovoid, papillose, 14–33 μm in longest dimension.

1. **Astomum muhlenbergianum** (Sw.) Grout, Moss Fl. N. Amer. 1(3): 152. 1938.
Phascum muhlenbergianum Sw., Adnot. Bot. 74. 1829.
[Synonym: *Weissia muhlenbergianum* (Sw.) Reese & Lemmon]
PLATE 106

Plants minute, stems up to 5 mm high, leaves linear-lanceolate to lanceolate, 2–3 mm long; capsules immersed, concealed in the leaves, globose to ovoid, lacking a peristome. Often growing with *Weissia controversa* and impossible to distinguish from it without sporophytes.

Habitat: On soil, either sandy or clay, in open situations long roadsides and in fields. No habitat was given for the Maritime collections.
Maritime Distribution: Rare or seldom collected. Nova Scotia (Hants, Kings).
Range: Nova Scotia to *Saskatchewan, south to *Arizona and the Gulf Coast States. *Asia.
Chromosome Number: n = 13, 26.

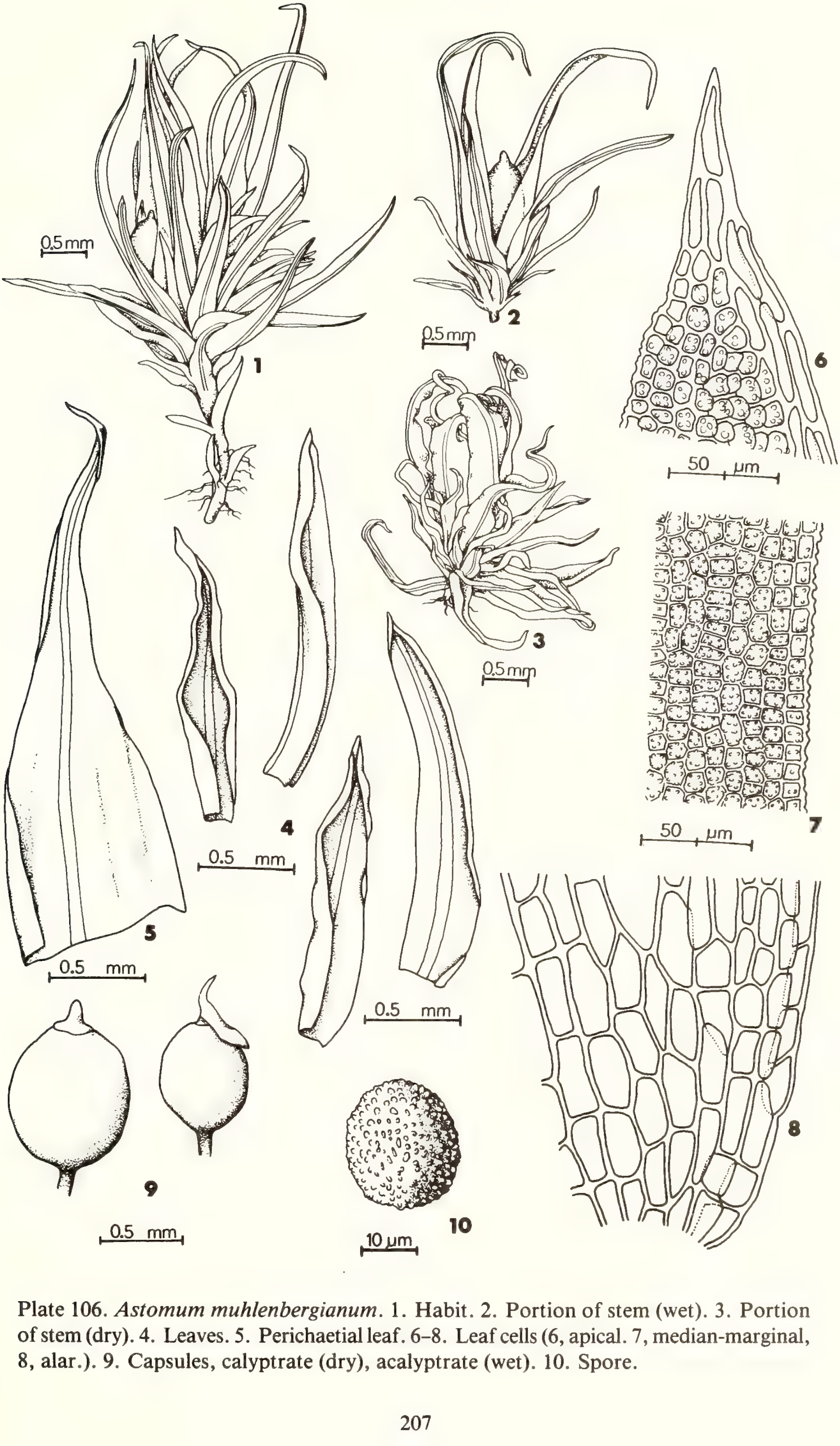
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Plate 106. *Astomum muhlenbergianum*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Perichaetial leaf. 6–8. Leaf cells (6, apical. 7, median-marginal, 8, alar.). 9. Capsules, calyptrate (dry), acalyptrate (wet). 10. Spore.

3. **Weissia** Hedw., Spec. Musc. 64. 1801.

Habit: Erect, loosely to densely gregarious.

Colour: Yellowish green to dull green, becoming brownish green with age.

Stems: 3–6 mm high, erect, simple or branching, rhizoids at base.

Leaves: Erect-spreading, straight to somewhat curved, crisped when dry, subtubulose above, lamina unistratose, lanceolate to linear-lanceolate, apex mucronate, base broad, subsheathing, nondecurrent. Perichaetial leaves similar to stem leaves, slightly longer.

Leaf Margins: Plane below, incurved to involute above, entire.

Costae: Single, excurrent into a short mucro, filling ¼–⅛ the base.

Leaf Cells: Densely multipapillose on both surfaces in upper part of leaves, few or no papillae on basal cells, the walls thin, lacking pits. Median cells quadrate, rounded, rectangular or hexagonal, basal cells rectangular and much longer.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perigonial buds near base of stem.

Calyptrae: Cucullate, naked, yellowish with a dark tip, covering operculum and extending to base of capsule.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown, becoming reddish brown with age, ovoid to oblong-cylindric, straight, erect, smooth or plicate when dry.

Setae: Straight to somewhat flexuose, smooth, twisted, yellow.

Annuli: Lacking or reported to be narrow and persistent.

Opercula: Long-rostrate, arcuate.

Peristomes: Lacking or single and consisting of 16, red, lanceolate, papillose teeth, not twisted, sometimes divided, perforate.

Spores: Yellowish brown, globose, papillose, 14–22 μm.

1. Capsules narrowed at mouth, smooth, peristome lacking .... 2. *W. hedwigii*
1. Capsules not or scarcely narrowed at mouth, usually plicate, peristome present, often short and rudimentary .... 1. *W. controversa*

1. Weissia controversa Hedw., Spec. Musc. 67. 1801.

[Synonym: *W. viridula* Hedw. *ex* Brid.]

PLATE 107

The capsules with short (up to 0.1 mm long), rudimentary peristome teeth will distinguish this species from *W. hedwigii*.

Habitat: On soil, soil over rock, or in rock crevices in exposed sites.

Maritime Distribution: Frequent. New Brunswick (Albert, Victoria); Nova Scotia (Colchester, Digby, Halifax, Hants, Kings, Victoria); Prince Edward Island (Prince).

Range: Nova Scotia to British Columbia, south to the Gulf States, Colorado, *Utah, and California. Central and *South America, West Indies, Europe, Asia, *Australia, New Zealand, *Pacific Islands.

Chromosome Number: n = 13, 14.

2. Weissia hedwigii Crum, Bryologist 74: 169. 1971.

Gymnostomum microstomum Hedw., Spec. Musc. 33. 1801.

[Synonyms: *Hymenostomum microstomum* (Hedw.) R. Br. *ex* Nees & Hornsch; *W. microstoma* (Hedw.) C. Müll., *non* Hornsch. *ex* Nees, Hornsch. & Sturm]

PLATE 108

The peristome teeth are lacking and the mouth of the capsules are often closed by a thin membrane in this species. In all other respects the plants appear similar to *W. controversa*.

Habitat: "On ground" is the only ecological information known for the Maritime collections.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Hants).

Range: Nova Scotia, New Jersey, Texas, *Massachusetts, *Ohio, and *Kansas. Europe, *Asia, *Africa.

Chromosome Number: n = 13, 26.

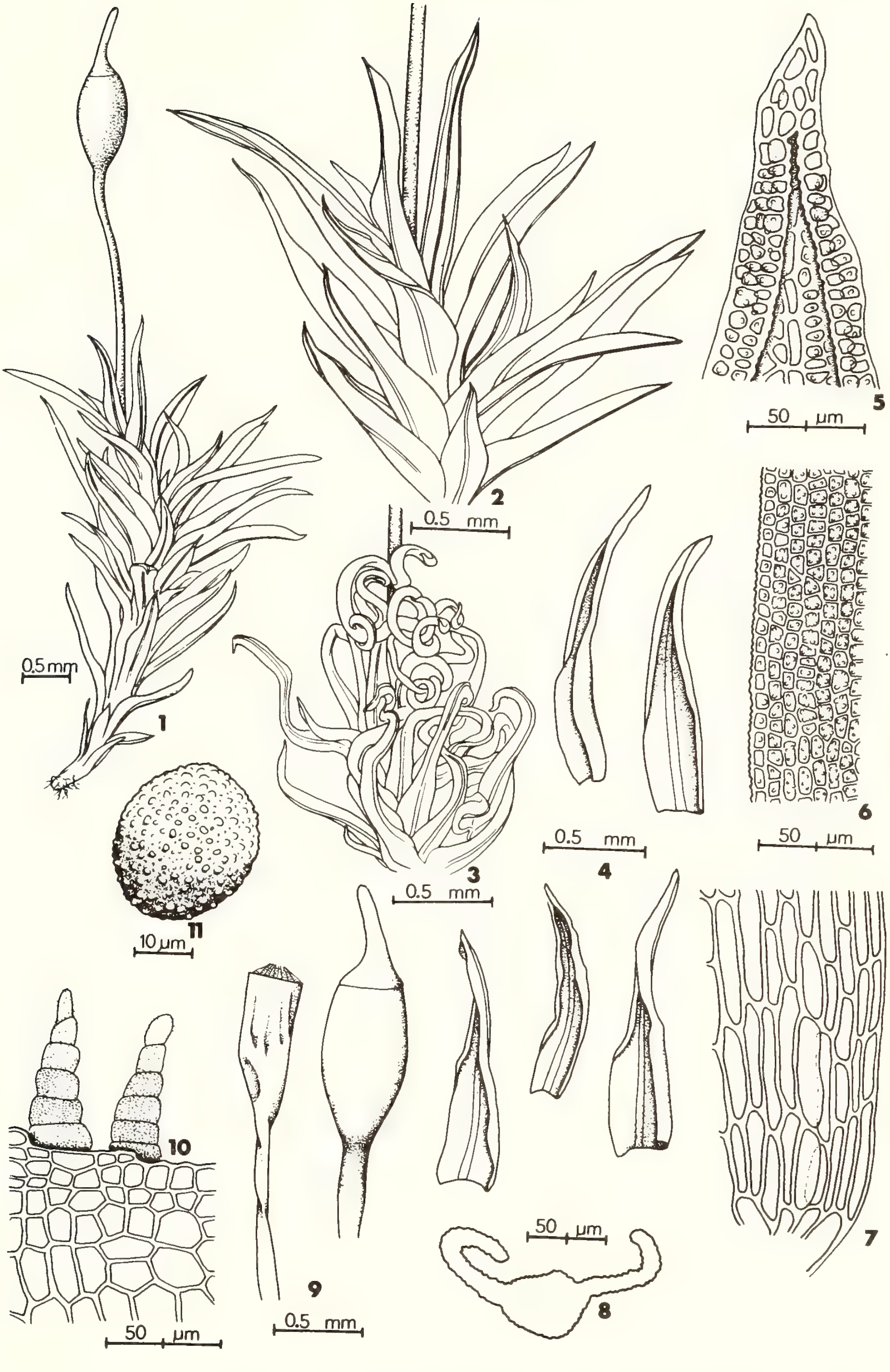
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Plate 107. *Weissia controversa*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf near middle. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth. 11. Spore.

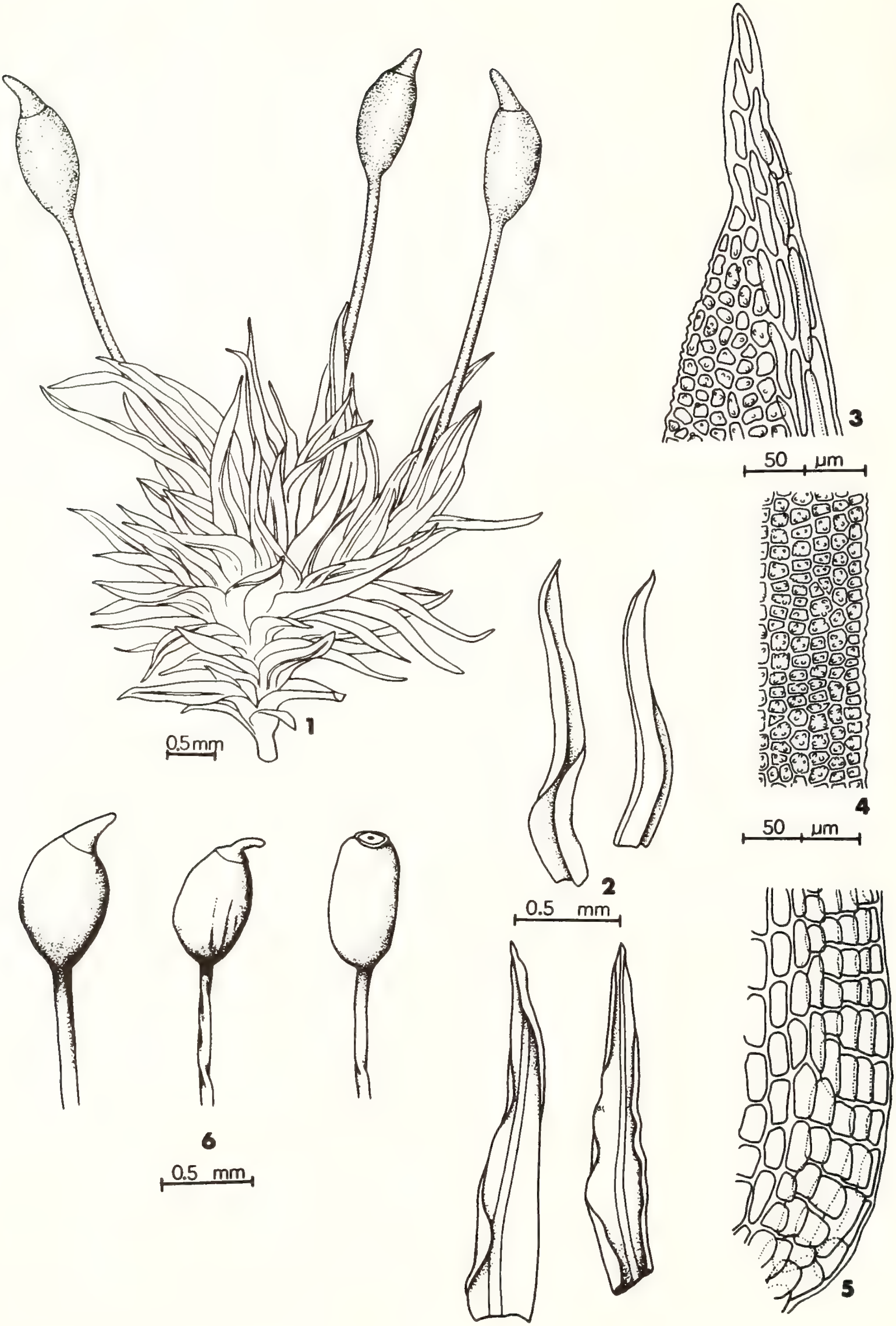
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Plate 108. *Weissia hedwigii*. 1. Habit. 2. Leaves. 3–5. Leaf cells (3, apical. 4, median-marginal. 5, alar.). 6. Capsules (wet on left).

4. **Oxystegus** (Limpr.) Hilp., Beih. Bot. Centralbl. 50(2): 666. 1933
Trichostomum subg. *Oxystegus* Limpr., Laubm. Deutschl. 1: 569. 1888.

Habit: In erect, loose tufts.

Colour: Dull, dark green to yellowish green above, brown below.

Stems: 0.5–1.5 cm high, erect, simple or with few branches, rhizoids at base.

Leaves: Erect-spreading, flexuose, crisped and contorted when dry, concave below, concave to keeled above, lamina unistratose, linear-lanceolate to ligulate, acute to acuminate, the apex often deciduous, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, undulate, crenulate-papillose, smooth at apex and near base.

Costae: Single, excurrent into a short mucro, prominent to obscure on dorsal surface, yellowish or brownish.

Leaf Cells: Densely multipapillose on both surfaces, a few apical cells and the basal cells smooth, the walls thin or of medium thickness, lacking pits. Median cells quadrate, hexagonal or rectangular, basal cells rectangular and much longer.

Asexual Reproductive Bodies: Lacking.

Sex: Sex organs and sporophytes unknown on Maritime plants. Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, light brown, reddish around mouth, cylindric, straight, erect, smooth, wrinkled when dry and empty.

Setae: Straight, smooth, twisted when dry, yellowish above, reddish below.

Annuli: 2–3 rows of cells, persistent.

Opercula: Long-rostrate, straight.

Peristomes: Single, consisting of 16 reddish, linear, papillose teeth, not twisted, sometimes divided, perforate, fragile.

Spores: Yellowish green to brownish green, globose to ovoid, minutely papillose to smooth, 9–14 μm in longest dimension.

1. **Oxystegus tenuirostre** (Hook. & Tayl.) Steere, Bryophytorum Bibliotheca 14: 172. 1978.
Weissia tenuirostris Hook. & Tayl., Musc. Brit. ed. 2: 83. Suppl. 3. 1827.
[Synonyms: *Trichostomum cylindricum* (Bruch *ex* Brid.) C. Müll.; *T. tenuirostre* (Hook. & Tayl.) Lindb.]
PLATE 109

Plants in loose tufts, stems 0.5–1.5 cm high; leaves erect-spreading when moist, flexuose, crisped and contorted when dry, linear-lanceolate to ligulate, acute to acuminate, the apex often deciduous, concave below, concave to keeled above, 2–5 mm long, cells densely multipapillose on both surfaces, margins plane, undulate, crenulate-papillose, smooth at apex and base, costae excurrent into short mucro; sex organs and sporophytes unknown on Maritime plants.

Habitat: On rock bluffs or cliff ledges, sometimes on thin soil over boulders.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Restigouche); Nova Scotia (Annapolis, Colchester, Halifax, Hants, Inverness, Kings, Lunenburg).

Range: Newfoundland to *Manitoba, south to *South Carolina, Tennessee and Arkansas; disjunct to western North America where it occurs in British Columbia, *Alberta, Washington, Colorado, and Arizona. Central and South America, Europe, *Asia, *Africa, Pacific Islands.

Chromosome Number: n = 13.

Remarks: Capsules and peristome teeth drawn from Quebec plants.

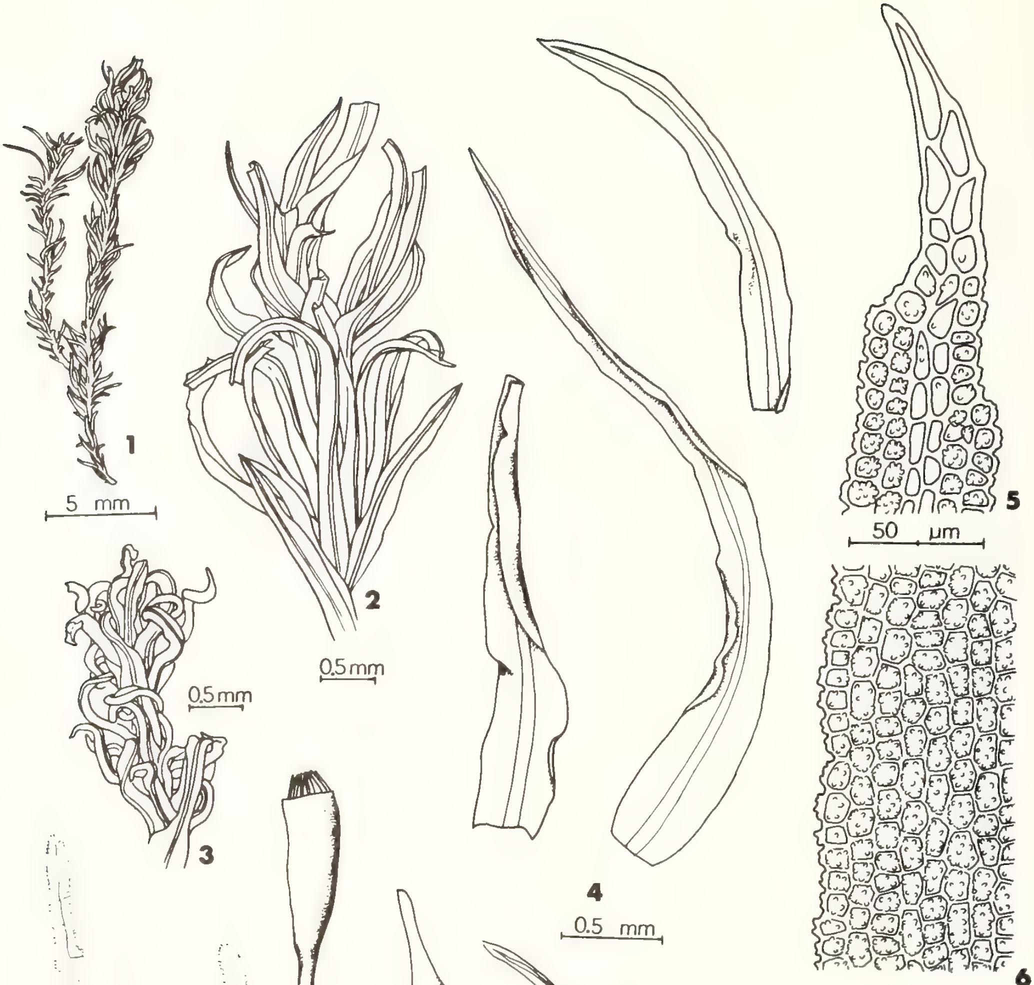
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Plate 109. *Oxystegus tenuirostre*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome teeth.

5. **Tortella** (Lindb.) Limpr., Laubm. Deutschl. 1: 520, 599. 1888. *nom. cons.*

Habit: Plants erect, in loose to dense tufts.

Colour: Dull, yellowish green to dark green, brownish with age.

Stems: 0.5–5.0 cm high, erect, simple or dichotomously branched, rhizoids at base, extending up stem to near apex.

Leaves: Erect-spreading to flexuose, strongly crisped and contorted when dry, concave below, concave to keeled above, lamina unistratose, linear-lanceolate to ligulate, oblong at base, acute, acuminate or apiculate, the apex sometimes deciduous, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, erect to incurved, undulate, crenulate-papillose to entire and smooth.

Costae: Single, excurrent into a subula or a short mucro, prominent to obscure on dorsal surface, glossy, yellowish or brownish.

Leaf Cells: Densely multipapillose on both surfaces, a few apical cells and the basal cells smooth, the walls thin or of medium thickness, lacking pits. Median cells mostly quadrate-rounded, some hexagonal and rectangular, basal cells rectangular and much longer with a V-shaped region of hyaline, smooth cells extending up the margins.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous or autoicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown, reddish around mouth, cylindric to ovoid-cylindric, straight or somewhat arcuate, erect, smooth, often wrinkled when dry and empty.

Setae: Straight to flexuose, smooth, twisted when dry, yellowish to reddish.

Annuli: Lacking or present and deciduous, of 3–4 rows of cells.

Opercula: Rostrate, straight or arcuate.

Peristomes: Single, consisting of 16, red, papillose teeth, twisted, divided to the base to form 2 filiform segments.

Spores: Yellow to greenish yellow, globose to ovoid, smooth to minutely papillose, 7–12 μm in longest dimension.

1. Leaf apices deciduous .... 3. *T. fragilis*
1. Leaf apices present, not deciduous 2
    2. Leaves gradually narrowing from the base to a slenderly acute apex; dioicous .... 2. *T. tortuosa*
    2. Leaves obtuse to obtusely acute with a mucronate apex; autoicous .... 1. *T. humilis*

1. Tortella humilis (Hedw.) Jenn., Man. Mosses W. Pennsylv. 96. 1913.
Barbula humilis Hedw., Spec. Musc. 116. 1801.
[Synonym: *T. caespitosa* (Schwaegr.) Limpr.]
PLATE 110

The autoicous plants bearing linear-lanceolate to ligulate leaves with a short apiculus separates this species from *T. tortuosa*.

Habitat: Seen only on soil over rock in the Maritimes but elsewhere it often occurs on bark at base of trees, logs, and stumps.

Maritime Distribution: Rare. New Brunswick (Albert); Nova Scotia (Inverness, Victoria).

Range: *Vermont to western Ontario, south to Florida, Louisiana, and Texas; disjunct to British Columbia, New Mexico, and *Arizona. Central and *South America, Europe, Asia, *Africa, Pacific Islands.

Chromosome Number: n = 15, 26.

2. Tortella tortuosa (Hedw.) Limpr., Laubm. Deutschl. 1: 604. 1888.
Tortula tortuosa Hedw., Spec. Musc. 124. 1801.
PLATE 111

The dioicous plants with linear-lanceolate leaves and spirally twisted, long-acuminate apices will distinguish this species from *T. humilis*.

Habitat: On calcareous soil or rock, usually on cliffs, rock outcrops, and boulders, rarely on soil over rotten stumps.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Queen's, Restigouche, Saint John, Victoria, York); Nova Scotia (Cape Breton, Colchester, Halifax, Hants, Inverness, Kings, Victoria).

Range: Greenland to Alaska, south to North Carolina, Michigan, Illinois, *Iowa, South Dakota, Colorado, Utah, Idaho, and Oregon. *Central and *South America, Europe, Asia, *Africa.

Chromosome Number: n = 13.

3. Tortella fragilis (Hook. & Wils.) Limpr., Laubm. Deutschl. 1: 606. 1888.
Didymodon fragilis Hook. & Wils. *ex* Drumm., Musci Bor. Amer. 127. 1828.
PLATE 112

Plants distinguished from the others in the genus by the leaves that have the upper portion broken off. These deciduous leaf apices presumably serve as a means of vegetative reproduction which is apparently its only means of reproduction since sporophytes are unknown on Maritime plants.

Habitat: On calcareous soil or rock, often on cliff ledges or in crevices.

Maritime Distribution: Rare. New Brunswick (Victoria); Nova Scotia (Inverness).

Range: Greenland to Alaska, south to New Jersey, Tennessee, Iowa, North Dakota, Colorado, Idaho, and *Oregon. Europe, *Asia, *Africa, *New Zealand.

Chromosome Number: Unreported.

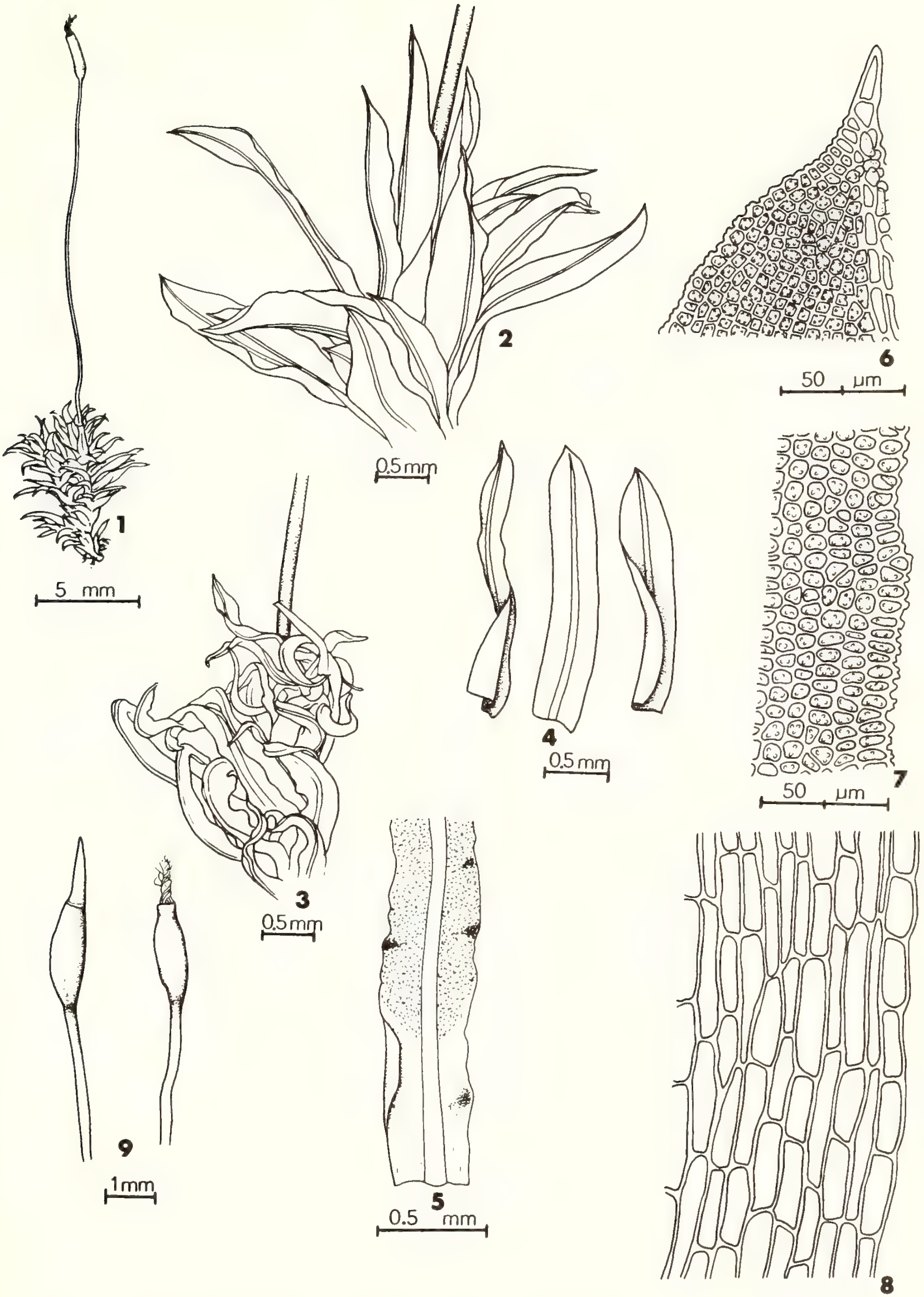
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Plate 110. *Tortella humilis*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Leaf base. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Capsules (dry).

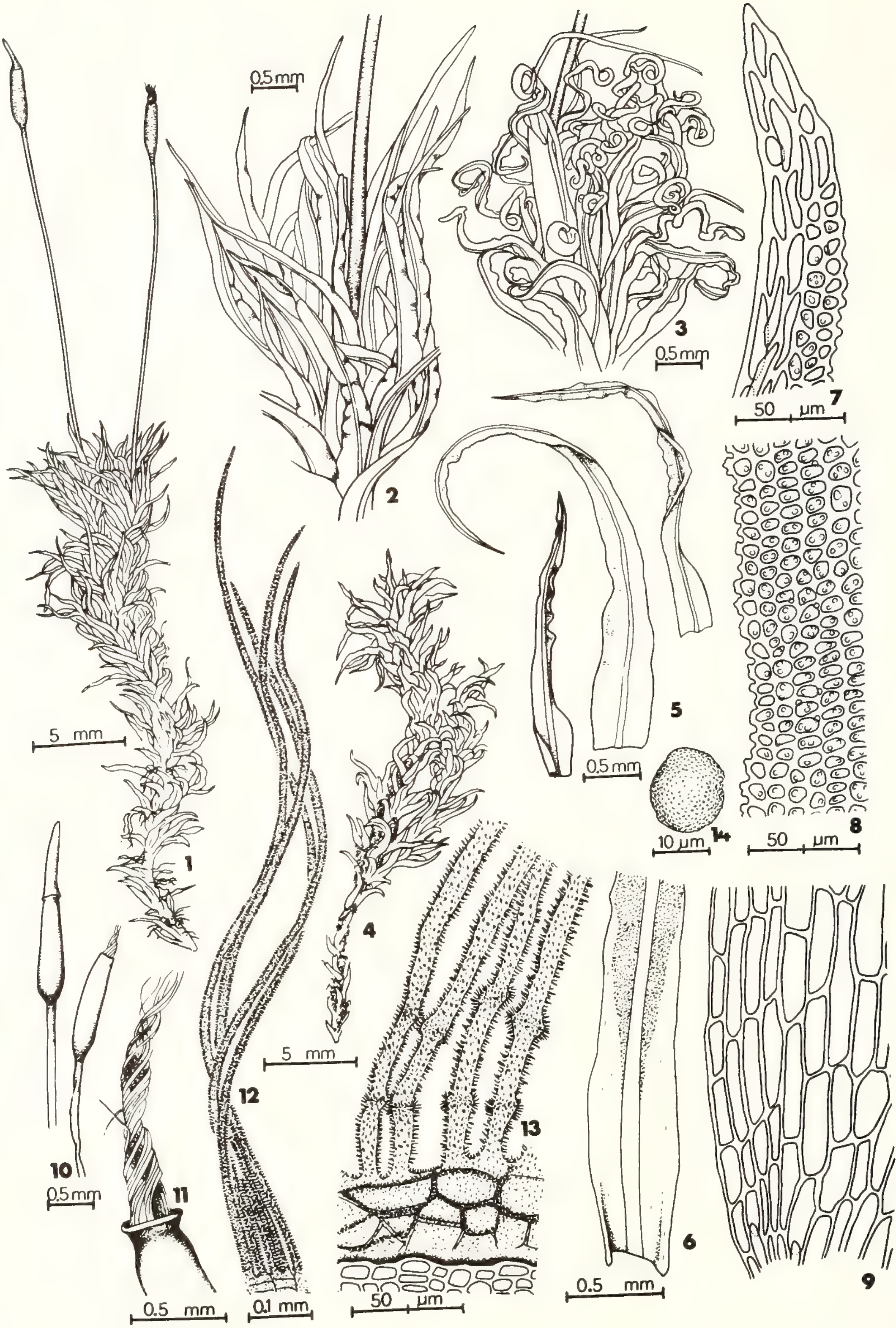
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Plate 111. *Tortella tortuosa*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Male plant. 5. Leaves. 6. Leaf base. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome. 12. Enlargement of peristome teeth. 13. Enlargement of portion of peristome teeth at base. 14. Spore.

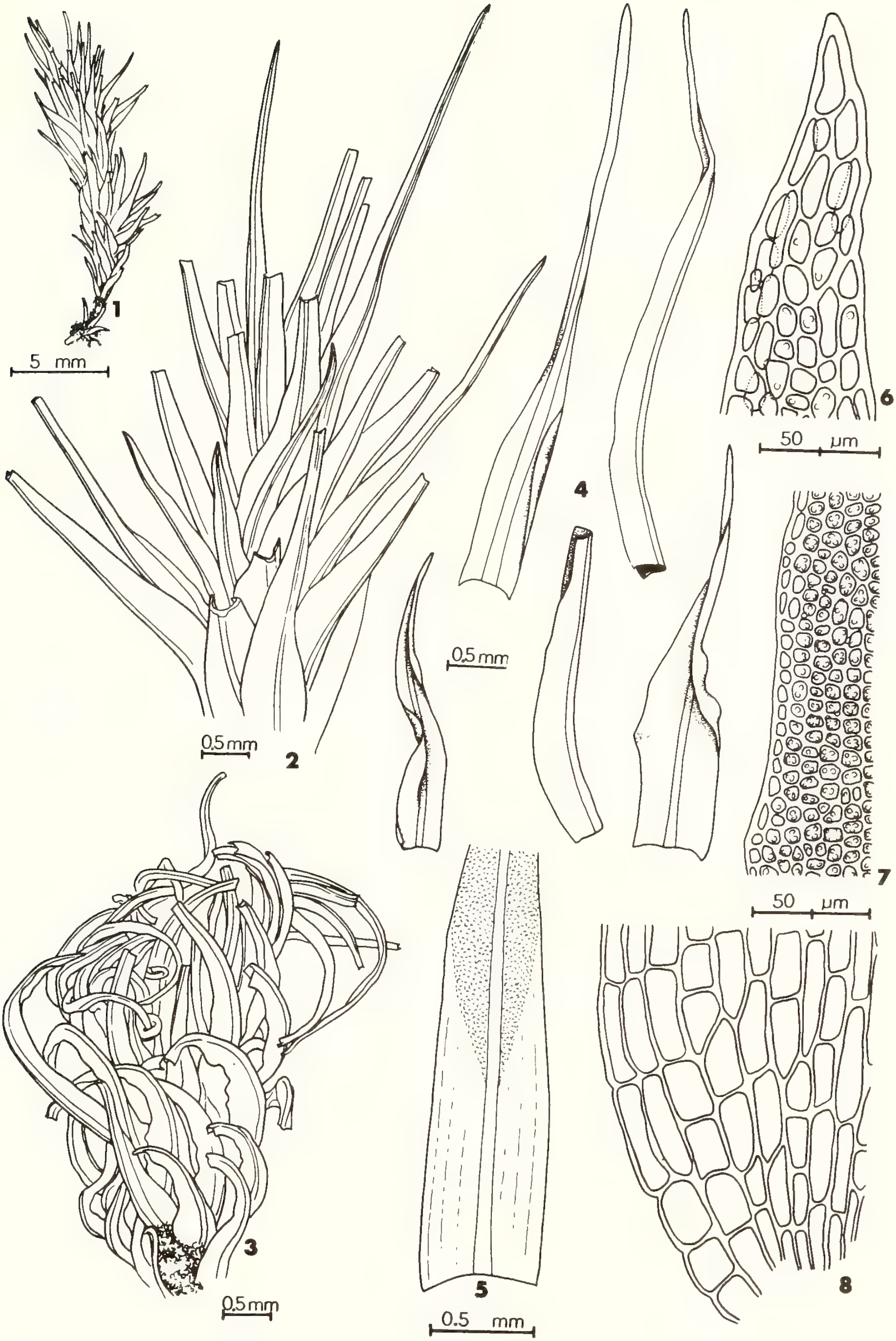
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Plate 112. *Tortella fragilis*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5. Leaf base. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.).

6. **Bryoerythrophyllum** Chen, Hedwigia 80: 4, 250. 1941.

Habit: In erect, loose to dense tufts.

Colour: Dark green to yellowish green above, reddish brown below.

Stems: 0.5–2.0 cm high, erect, simple or dichotomously branched, rhizoids at base and extending up stem.

Leaves: Erect-spreading and flexuose, crisped and curled when dry, keeled, lamina unistratose, linear-lanceolate to ligulate, acute to mucronate, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Recurved nearly to apex, crenulate-papillose, a few teeth at apex.

Costae: Single, percurrent or ending as a pellucid mucro, prominent on dorsal surface.

Leaf Cells: Densely multipapillose with small, branched papillae on both surfaces, the basal cells and the apical mucro smooth, the walls thin or thick, lacking pits. Median cells irregularly rounded to rounded-quadrate or rounded-rectangular, becoming rectangular and larger near base.

Asexual Reproductive Bodies: Lacking.

Sex: Synoicous or paroicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, cylindric, straight or somewhat arcuate, erect, smooth, sometimes weakly wrinkled when dry.

Setae: Straight to flexuose, smooth, twisted when dry, red.

Annuli: 2 rows of cells, deciduous.

Opercula: Rostrate, straight or arcuate.

Peristomes: Single, consisting of 16, yellow or orange, lanceolate, papillose teeth, not twisted, undivided or divided to about the middle.

Spores: Yellow to greenish yellow, globose or ovoid, smooth to minutely papillose, 12–21 μm in longest dimension.

1. **Bryoerythrophyllum recurvirostrum** (Hedw.) Chen, Hedwigia 80: 5. 1941.
Weissia recurvirostra Hedw., Spec. Musc. 71. 1801.
[Synonyms: *Didymodon recurvirostris* (Hedw.) Jenn.; *D. rubellus* B.S.G.]
PLATE 113

Plants dark green to yellowish green above, reddish brown below; leaves erect-spreading when moist, crisped and curled when dry, linear-lanceolate to ligulate, acute to mucronate, keeled, 2.0-3.5 mm long, cells densely multipapillose on both surfaces with small, branched papillae, margins recurved from base to near apex, crenulate-papillose, a few teeth at apex, mucro and basal cells smooth, costa percurrent or ending in a pellucid mucro; synoicous or paroicous, capsules cylindric, straight or somewhat arcuate, erect, peristome teeth short, erect, not twisted.

Habitat: On calcareous soil, commonly on soil over boulders and cliff ledges beside rivers.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Queen's, Restigouche, Saint John, Victoria, Westmorland); Nova Scotia (Cape Breton, Colchester, Cumberland, Hants, Inverness, Kings, Victoria, Yarmouth).

Range: Greenland to Alaska, south to New Jersey, *North Carolina, Michigan, Arkansas, *Texas, New Mexico, Arizona, and California. Mexico, Europe, Asia, Africa, *Australia, New Zealand, *Pacific Islands.

Chromosome Number: n = 13, 14.

Remarks: The reddish brown or brick-red colour of the lower part of the gametophytes is distinctive.

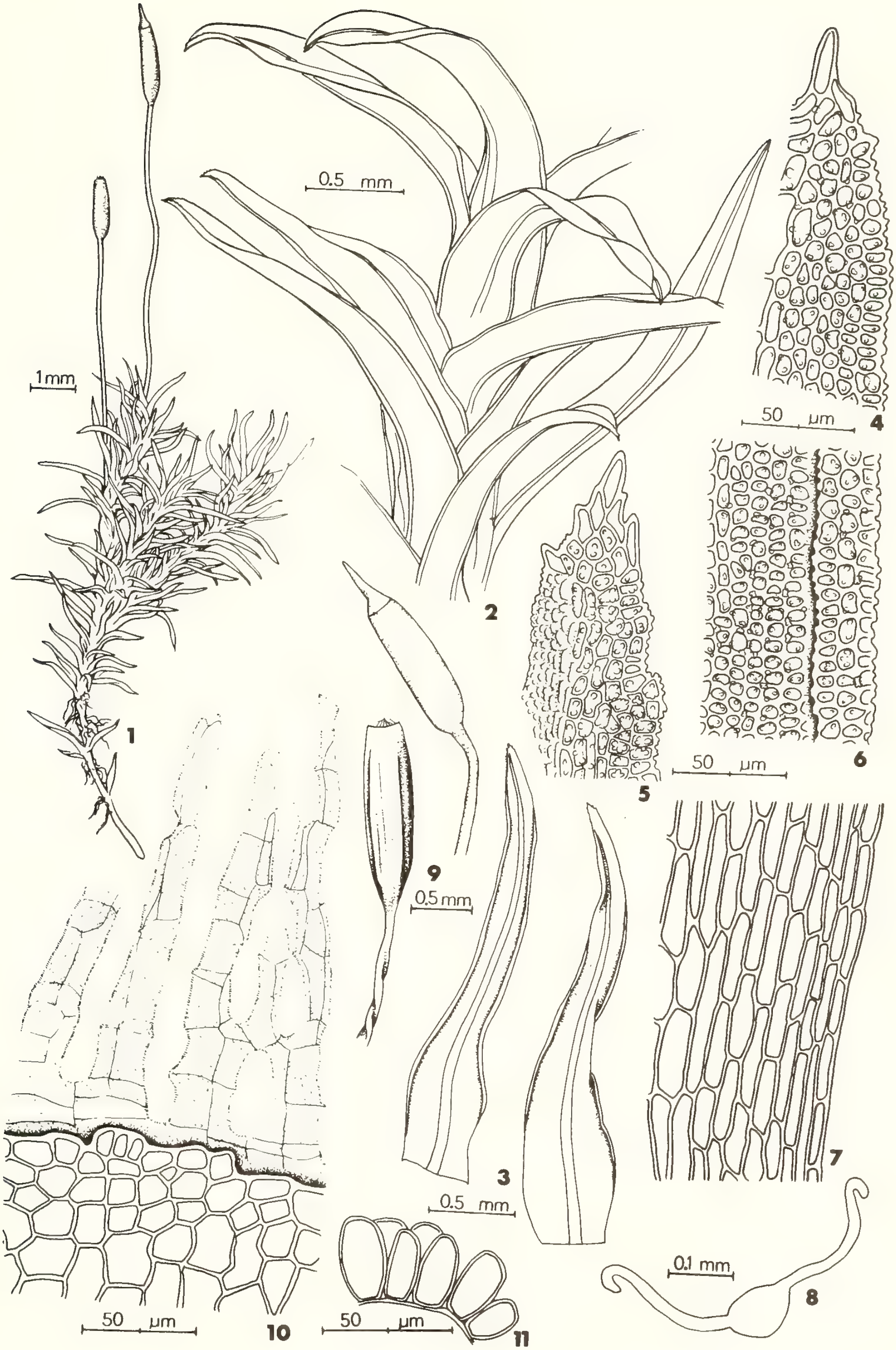
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Plate 113. *Bryoerythrophyllum recurvirostrum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4–5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf at middle. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth. 11. Annulus.

7. **Didymodon** Hedw., Spec. Musc. 104. 1801.

Habit: In erect, loose to dense tufts.

Colour: Dark green, brownish green, sometimes yellowish green or brown.

Stems: 0.5–1.5 cm high, erect, simple or dichotomously branched, rhizoids at base.

Leaves: Erect-spreading, somewhat contorted when dry, concave to weakly keeled, lamina unistratose below, bistratose near apex, lanceolate to ovate-lanceolate, narrowly obtuse, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Recurved from base to near apex, entire or nearly so, bistratose near apex.

Costae: Single, percurrent or ending a few cells below apex, prominent on dorsal surface of leaf, sometimes brownish or reddish.

Leaf Cells: Indistinctly papillose on both surfaces, 1–4 rounded papillae per cell, the walls thick, lacking pits. Median cells irregularly rounded to rounded-quadrate, becoming rectangular and larger near base.

Asexual Reproductive Bodies: Frequently with clusters of yellowish brown, globose to ovoid, smooth, multicellular propagules, occurring on branched stalks on the stems in the upper leaf axils.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, oblong-cylindric, straight or rarely somewhat arcuate, erect, smooth.

Setae: Straight to somewhat flexuose, smooth, twisted when dry, reddish.

Annuli: Lacking or present and persistent.

Opercula: Rostrate, straight to slightly arcuate.

Peristomes: Single, consisting of 16, red, papillose teeth, not twisted, divided nearly to base into 2 filiform segments.

Spores: Yellow to greenish yellow, globose, smooth to minutely papillose, 9–14 μm.

1. **Didymodon rigidulus** Hedw., Spec. Musc. 104. 1801.

PLATE 114

Plants in loose to dense tufts, stems 0.5–1.5 cm high, bearing clusters of yellowish brown, globose to ovoid, smooth-walled, multicellular gemmae occurring on branched stalks in the upper leaf axils; leaves erect-spreading when moist, somewhat contorted when dry, lanceolate to ovate-lanceolate, narrowly obtuse, concave to weakly keeled, bistratose near apex, 1–2 mm long, cells indistinctly papillose with 1–4 rounded papillae, margins recurved from base to near apex, entire, costae percurrent or ending just below apex; dioicous, capsules solitary at stem apex on long setae, oblong-cylindric, straight, erect, smooth, peristome teeth short, erect, not twisted.

Habitat: On calcareous soil, especially on soil over boulders along streams or on ledges near waterfalls.

Maritime Distribution: Rare. New Brunswick (Albert, Victoria, York); Nova Scotia (Annapolis).

Range: Newfoundland to western Ontario, south to *Florida and *Tennessee; disjunct to western North America where it occurs in British Columbia, south to *California. *South America, Europe, Asia, *Africa.

Chromosome Number: n = 12, 13.

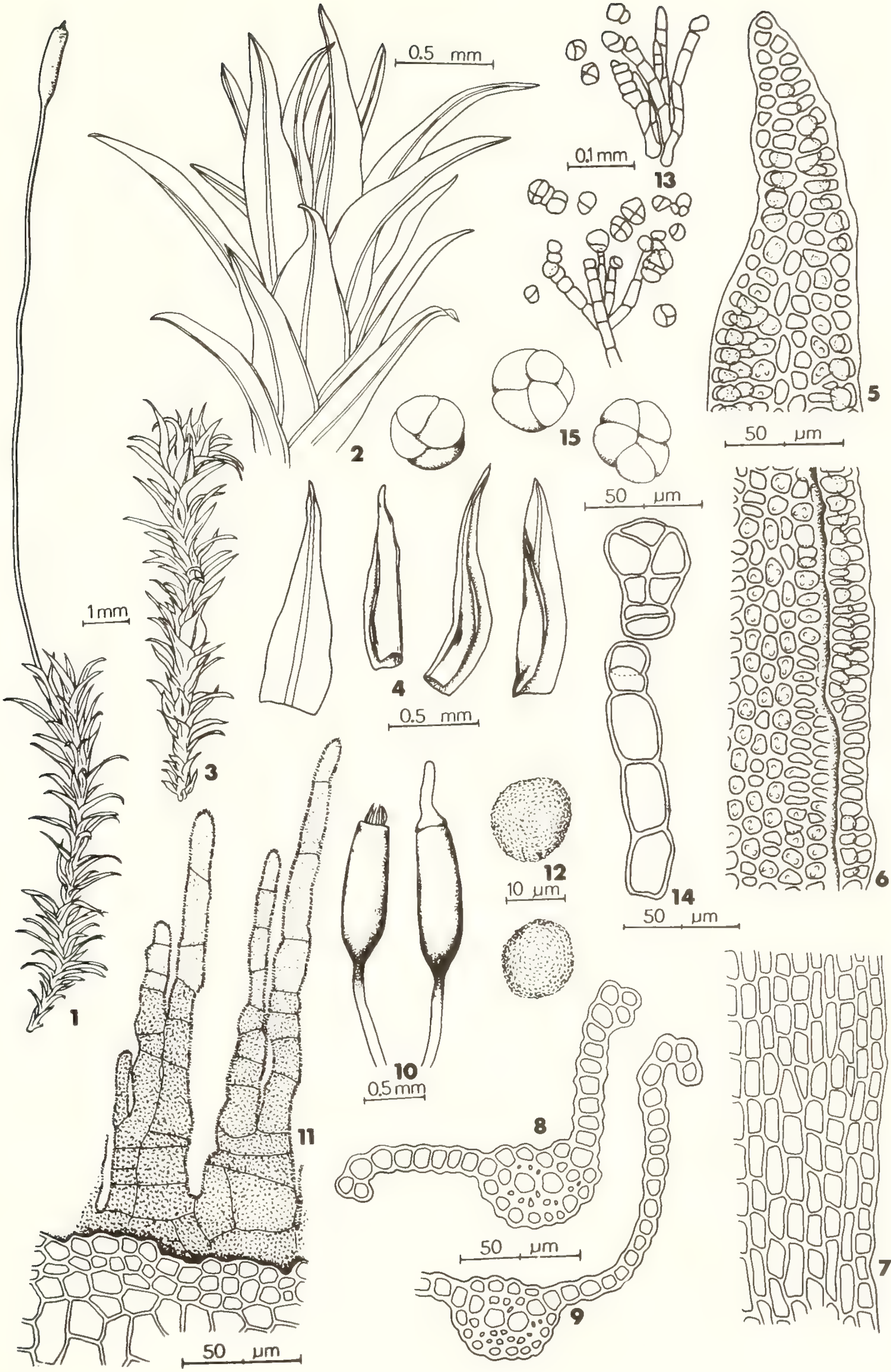
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Plate 114. *Didymodon rigidulus*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf near apex. 9. Cross-section of leaf near middle. 10. Capsules (dry). 11. Peristome teeth. 12. Spore. 13–15. Gemmae.

8. **Barbula** Hedw., Spec. Musc. 115. 1801. *nom. cons.*

Habit: Erect, loosely or densely tufted, sometimes gregarious.

Colour: Dull, dark green, yellowish green, brownish or reddish.

Stems: 0.5–3.0 cm high, erect, simple or dichotomously branched, rhizoids at base.

Leaves: Erect-spreading or recurved to squarrose, nearly erect and straight or crisped and contorted when dry, concave below, concave to keeled above, lamina unistratose, lanceolate, ovate-lanceolate, oblong-lanceolate, or lingulate, acute, acuminate or obtuse and ending in a short to long mucro, nondecurrent to shortly decurrent. Perichaetial leaves undifferentiated or convolute-sheathing and clasping base of seta.

Leaf Margins: Recurved, often nearly to apex, rarely plane, entire to crenulate-papillose.

Costae: Single, ending just below apex to excurrent, prominent on dorsal surface, often yellow, brown, or red.

Leaf Cells: Papillose on both surfaces with several, small, branched papillae, or with 1–2 large, simple or branched papillae, the basal and often the apical cells smooth, the walls thin or of medium thickness, lacking pits. Median cells rounded, quadrate-rounded, hexagonal, or rectangular, basal cells rectangular and longer.

Asexual Reproductive Bodies: Globose or irregularly shaped, brown to reddish brown tubers, 100–150 μm in longest dimension, sometimes on rhizoids of *B. convoluta*.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, cylindric to ovoid-cylindric, straight, erect, smooth.

Setae: Straight to flexuose, smooth, twisted when dry, yellowish to reddish brown.

Annuli: Lacking or present, of 2–3 rows of deciduous cells, or of 1–2 rows of small persistent cells.

Opercula: Rostrate, straight or arcuate.

Peristomes: Single, consisting of 16, red, papillose teeth, twisted, divided to the base to form 2 filiform segments.

Spores: Yellow to greenish yellow, globose to ovoid, smooth, 7–17 μm in longest dimension.

1. Leaves lanceolate, gradually tapering from the base to an acute apex; median leaf cells thick-walled, 1–2 papillae per cell . . . . 2. *B. fallax*
1. Leaves lingulate with an obtuse to broadly acute apex, sometimes ending in a mucro; median leaf cells thin-walled, multipapillose 2
    2. Leaf margins plane or recurved at base; costae subpercurrent to percurrent; inner perichaetial leaves convolute, sheathing base of seta; setae yellow . . . . 1. *B. convoluta*
    2. Leaf margins recurved to middle of leaf or above; costae excurrent as a mucro; inner perichaetial leaves scarcely differentiated; setae red 3
        3. Costae excurrent as a short mucro . . . . 3. *B. unguiculata*
        3. Costae excurrent as a long mucro . . . . 3a. *B. unguiculata* f. *apiculata*

1. **Barbula convoluta** Hedw., Spec. Musc. 120. 1801.

[Synonym: *Streblotrichum convolutum* (Hedw.) P. Beauv.]

PLATE 115

The oblong-lanceolate to lingulate leaves, obtuse to broadly acute, with margins plane or recurved at base, median leaf cells thin-walled, multipapillose, and the sporophytes with yellow setae, combine to distinguish this species from the others. This is apparently the only Maritime *Barbula* with rhizoidal gemmae.

Habitat: On calcareous soil in open, disturbed habitats, such as roadsides, gravel pits, fields, etc.

Maritime Distribution: Frequent. New Brunswick (Kent, Victoria, York); Nova Scotia (Hants, Inverness); Prince Edward Island (Queens).

Range: Newfoundland to Alaska, south to *Georgia, *Tennessee, Michigan, *Arkansas, Montana, and California. *Central America, Europe, Asia, *Africa, *New Zealand.

Chromosome Number: n = 11, 13, 14.

Remarks: *Desmatodon obtusifolius* (Schwaegr.) Schimp. may be confused with this species when sterile. The leaf margins that are recurved nearly to the apex even when wet and the larger leaf cells will distinguish the *Desmatodon*.

2. Barbula fallax Hedw., Spec. Musc. 120. 1801.
PLATE 116

The lanceolate to ovate-lanceolate leaves with an acute to acuminate apex and the thick-walled median leaf cells with 1–2 papillae will separate this species from the others in the genus.

Habitat: On calcareous soil banks, sometimes on soil over boulders and bluffs beside rivers.

Maritime Distribution: Frequent. New Brunswick (Restigouche, Victoria); Nova Scotia (Cumberland, Hants, Inverness, Kings, Lunenburg, Victoria); Prince Edward Island (Queens).

Range: Newfoundland to Yukon Territory, south to North Carolina, Tennessee, Louisiana, Nebraska, Colorado, Idaho, and California. Europe, Asia, *Africa.

Chromosome Number: n = 13.

Remarks: It is often difficult to discern whether the leaf cells have one or two papillae per cell. Crum (1976) states that there is only a single papilla on each surface which may be true for some plants.

Erskine (1953) reported *B. reflexa* (Brid.) Brid. for Nova Scotia (Cape Breton Co.) but I am unable to confirm this report. The plants are somewhat similar to *B. fallax* but the leaves are recurved to squarrose when moist and the leaf cells have several papillae.

3. Barbula unguiculata Hedw., Spec. Musc. 118. 1801.
PLATE 117

This is the most common species of *Barbula* in the Maritimes. It has oblong-lancolate to lingulate leaves, mucronate apices, leaf margins recurved from base to middle or above, median leaf cells thin-walled, densely multipapillose, and red setae.

Habitat: On calcareous soil or soil over rock, in open, usually disturbed habitats, especially roadsides and woodland trails.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Restigouche, Victoria); Nova Scotia (Annapolis, Cumberland, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Nova Scotia to British Columbia, south to the Gulf States, New Mexico, *Utah, and California. *Central and *South America, Europe, Asia, *Africa, *Australia, Pacific Islands.

Chromosome Number: n = 11, 12, 13, 14, 15, 16, 24.

3a. Barbula unguiculata f. **apiculata** (Hedw.) Mönk., Laubm. Eur. 286. 1927.
Barbula apiculata Hedw., Spec. Musc. 117. 1801.
[Synonym: *B. unguiculata* var. *apiculata* (Hedw.) B.S.G.]
PLATE 117

Similar to the var. *unguiculata* and differing only by the longer costa which forms a long mucro.

Habitat: On clay soil under overhanging rocks or on roadside banks.

Maritime Distribution: Rare. Prince Edward Island (Kings, Queens).

Range: Very poorly known. Prince Edward Island and *Pennsylvania. Europe.

Chromosome Number: Unreported.

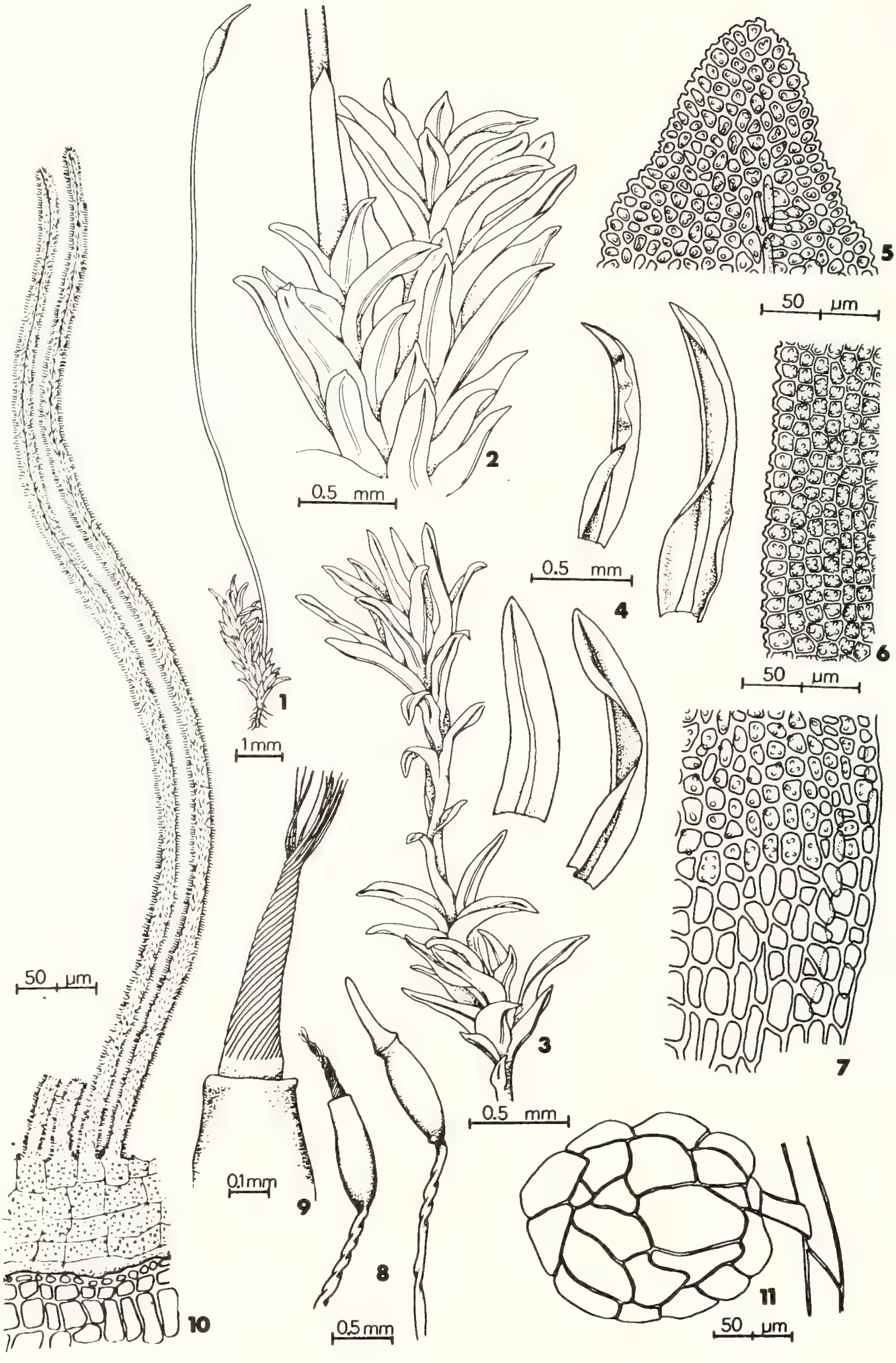
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Plate 115. *Barbula convoluta*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Peristome. 10. Enlargement of peristome teeth. 11. Rhizoidal gemma.

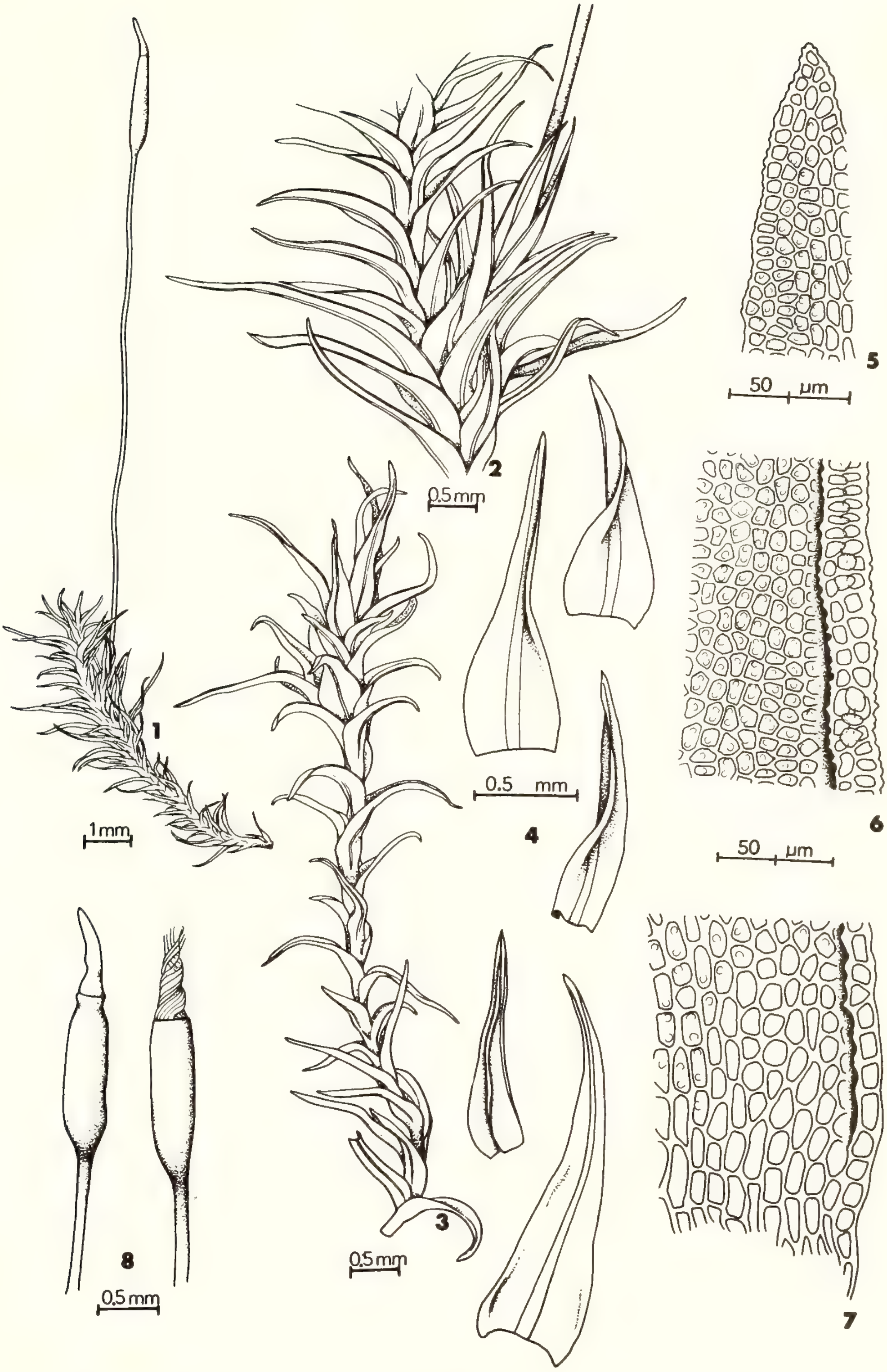
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Plate 116. *Barbula fallax*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

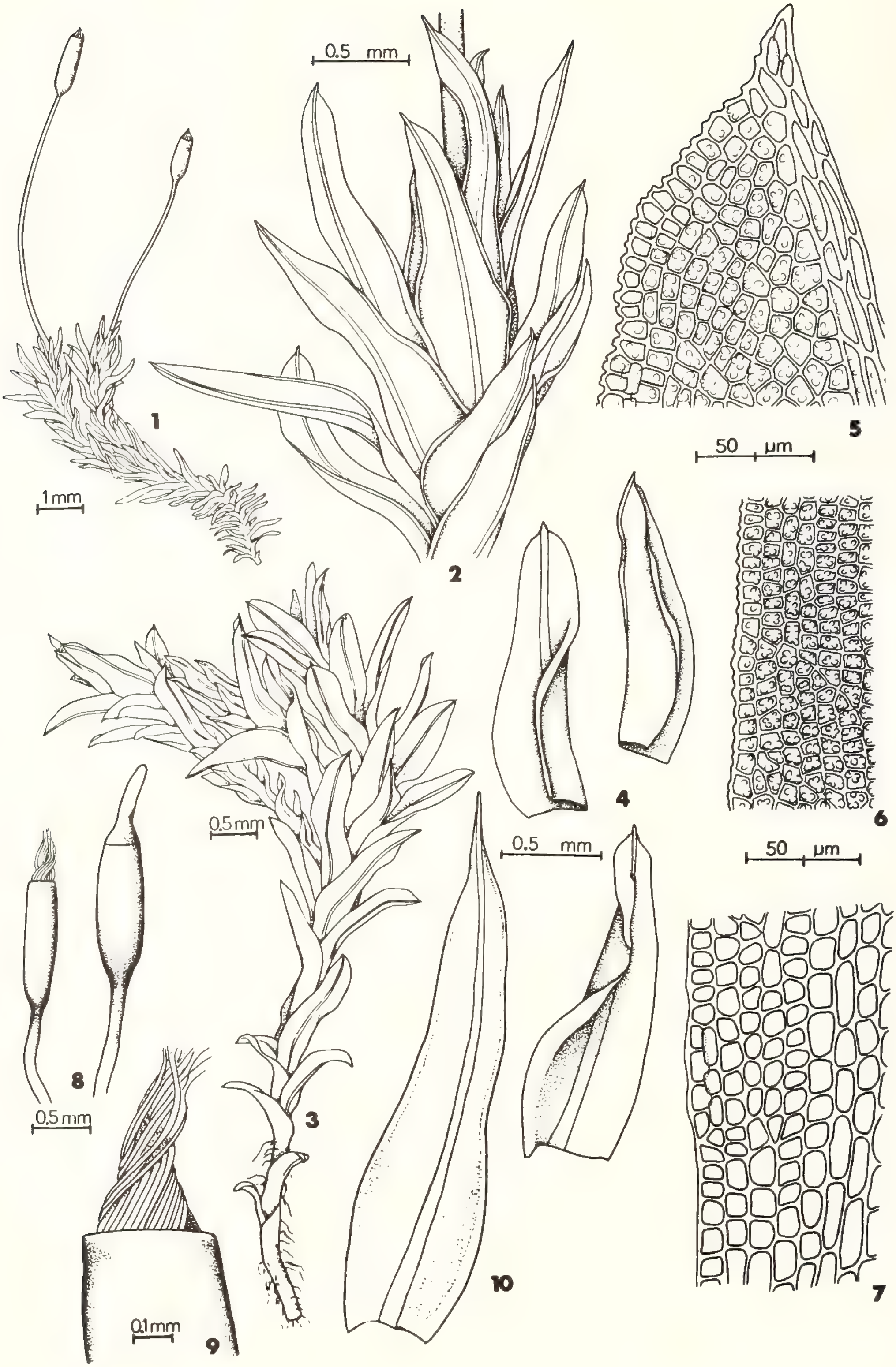
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Plate 117. *Barbula unguiculata*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome. 10. *Barbula unguiculata* f. *apiculata*, leaf.

9. **Phascum** Hedw., Spec. Musc. 19. 1801.

Habit: Erect, scattered or sometimes gregarious.

Colour: Green to yellowish green or yellowish brown with age.

Stems: 2–3 mm high, erect, simple or sometimes forked, rhizoids at base.

Leaves: Erect to slightly spreading, somewhat contorted when dry, weakly keeled, lamina unistratose, ovate to oblong-lanceolate, acute to acuminate, sometimes piliferous, nondecurrent. Perichaetial leaves similar to stem leaves or somewhat broader.

Leaf Margins: Plane or recurved near the middle, sometimes to near the apex, entire or nearly so.

Costae: Single, smooth, excurrent into a short to long awn, scarcely prominent on dorsal surface of leaf.

Leaf Cells: Smooth or with several C-shaped papillae over lumens on both surfaces, the walls thin or of medium thickness, lacking pits. Median cells quadrate, hexagonal or rectangular, becoming longer and wider near base.

Asexual Reproductive Bodies: Lacking on plants from the Maritime Provinces. Large, multicellular gemmae reported to occur on the rhizoids of plants from western North America (Flowers, 1973).

Sex: Autoicous. Antheridia in leaf axils below perichaetium.

Calyptrae: Cucullate, naked, yellowish with reddish tip, covering upper part of capsule.

Capsules: Solitary, immersed, on a short seta at stem apex, brown, globose, to ellipsoidal, bluntly apiculate, smooth.

Setae: Short, straight or arcuate, smooth.

Annuli: Lacking.

Opercula: Lacking.

Peristomes: Lacking.

Spores: Yellowish brown to brown, globose to ovoid, strongly papillose, 23–33 μm in longest dimension.

1. **Phascum cuspidatum** Hedw., Spec. Musc. 22. 1801.
[Synonyms: *P. cuspidatum* var. *americanum* Ren. & Card.; *P. cuspidatum* var. *henrici* (Ren. & Card.) Wijk & Marg.]
PLATE 118

Plants scattered or gregarious, stems 2–3 mm high; leaves erect to slightly spreading, somewhat contorted when dry, ovate to oblong-lanceolate, acute to acuminate, sometimes piliferous, weakly keeled, 1.5–3.0 mm long, margins plane or recurved near the middle and sometimes to the apex, entire, costae excurrent, smooth, leaf cells smooth, quadrate, hexagonal or rectangular, 14–38 μm in longest dimension; autoicous, capsules immersed, solitary at stem apex, urn globose to ellipsoidal, smooth, 0.8–1.2 mm long, operculum and peristome lacking.

Habitat: On bare, often calcareous soil, in exposed situations, especially fields, pastures and roadsides.

Maritime Distribution: Rare or seldom collected. Known only from two collections in Nova Scotia (Hants, county unknown).

Range: Nova Scotia to southern British Columbia, south to *Tennessee, *Iowa, *Texas, New Mexico, Arizona, and California. *South America, Europe, *Asia, *Africa.

Chromosome Number: n = 21, 26, 29, 42, 52.

Remarks: Several C-shaped papillae are often present over the lumens of the leaf cells of *P. cuspidatum* but they are absent on the Nova Scotia plants.

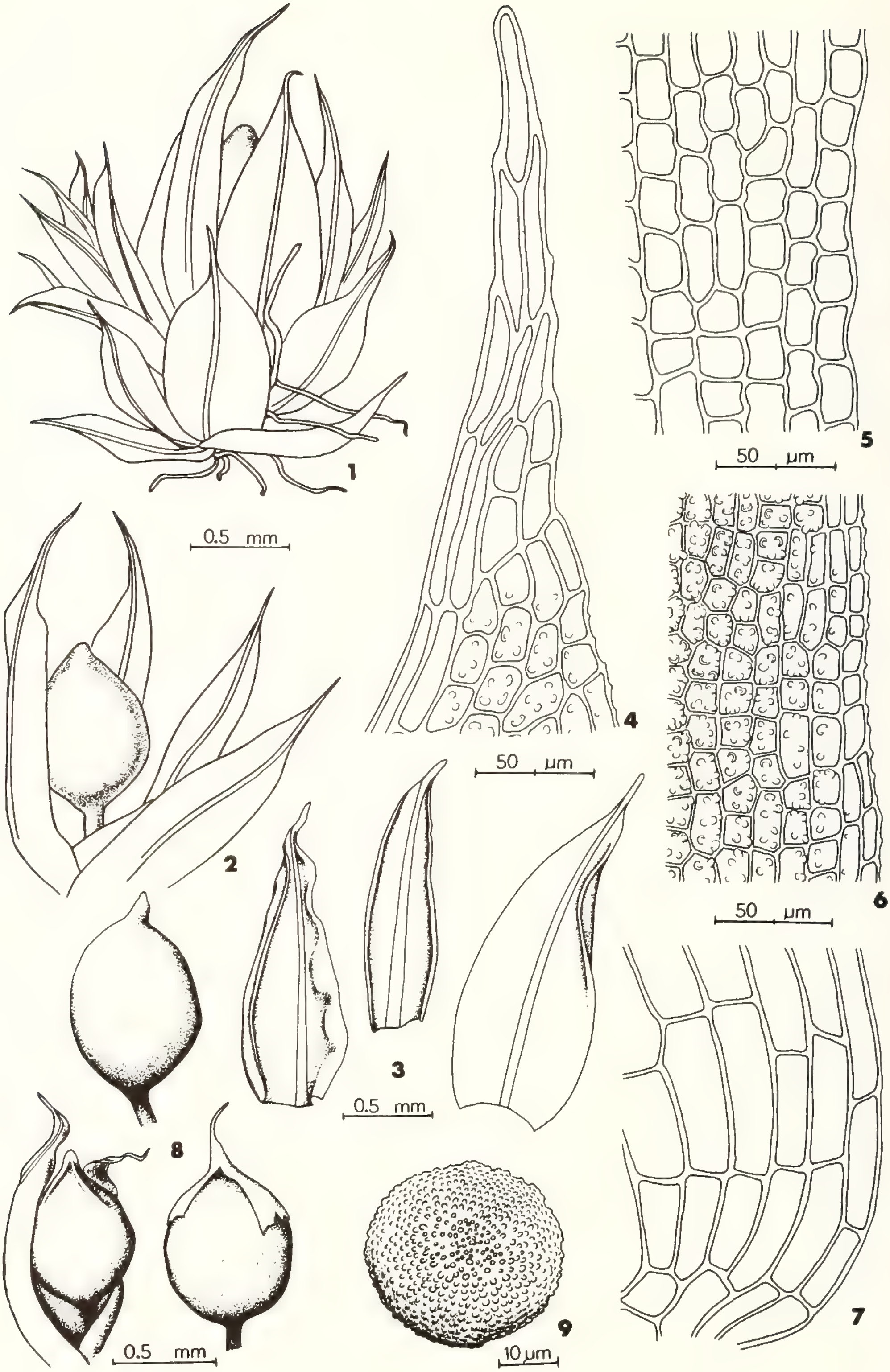
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Plate 118. *Phascum cuspidatum*. 1. Habit. 2. Capsule with perichaetial leaves. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median-marginal (smooth). 6, median-marginal (papillose). 7, alar.). 8. Capsules (dry at bottom left). 9. Spore.

10. **Aloina** (C. Müll.) Kindb., Bih. Svenske Vet. Ak. Handl. 6(19): 22. 1882. *nom. cons.*
Barbula sect. *Aloina* C. Müll., Syn. 1: 596. 1849.

Habit: Erect, scattered to densely gregarious.

Colour: Light green to yellowish green, reddish brown with age.

Stems: 1-2 mm high, erect, simple, rhizoids at base.

Leaves: Erect-spreading, straight or somewhat arcuate, little changed when dry, fleshy, concave, lingulate, obtuse, nondecurrent, cucullate, ventral surface with numerous, branched filaments, 2-6 cells high, ending in a conical to sphaerical cell. Perichaetial leaves undifferentiated.

Leaf Margins: Folded over ventral surface in upper half of leaf, plane below, entire.

Costae: Single, ending below apex, scarcely prominent on dorsal surface, covering $^1/_4$–$^1/_3$ of the leaf, often brown.

Leaf Cells: Smooth, thick-walled, lacking pits. Median cells round, elliptical, rectangular, often transversely elongate, becoming longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Synoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, cylindric, straight, erect, smooth.

Setae: Straight to somewhat flexuose, smooth, twisted when dry, reddish brown.

Annuli: 1-2 rows of large cells, deciduous.

Opercula: Short-rostrate, straight.

Peristomes: Single, consisting of 32, red, filamentous, papillose teeth, twisted, arising from a basal membrane that projects above the mouth of the capsule.

Spores: Yellow to greenish yellow, globose, minutely papillose, 14–31μm.

1. **Aloina brevirostris** (Hook. & Grev.) Kindb., Bih. K. Svenske Vet. Ak. Handl. 7(9): 137. 1883. *Tortula brevirostris* Hook. & Grev., Edinburgh J. Sci. 1(2): 289. 1824.
[Synonym: *Barbula rigida* var. *brevirostris* (Hook. & Grev.) Brid.]
PLATE 119

The lingulate, cucullate, fleshy leaves, 0.7–2.0 mm long, with numerous, branched filaments on the ventral surface are an easy means of recognizing this rare moss.

Habitat: On soil over limestone.

Maritime Distribution: Rare. Known only from a single locality in Nova Scotia (Hants Co.) where J.S. Erskine & W.B. Schofield collected it 10 April 1953, in a gypsum quarry near Wentworth.

Range: Greenland to Alaska, south to *Montana and other parts of the northern United States. Europe, *Asia.

Chromosome Number: n = 24, 28.

Remarks: Delgadillo (1975) revised the genus *Aloina* on a worldwide basis.

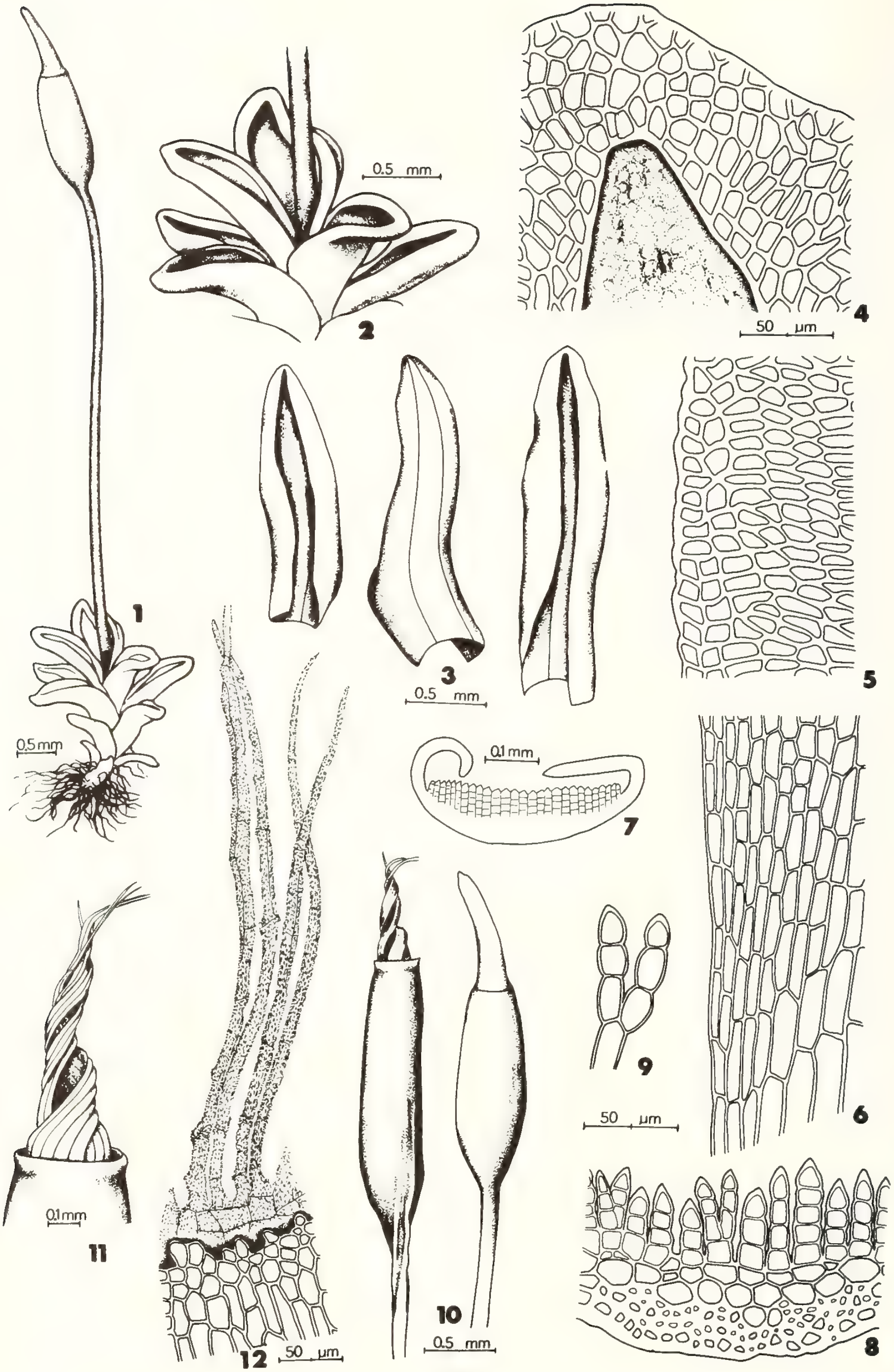

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Plate 119. *Aloina brevirostris*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Cross-section of leaf at middle. 8. Cross-section of leaf showing filaments. 9. Filament. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome. 12. Peristome teeth.

11. **Pottia** (Reichenb.) Ehrh. *ex* Fürnr., Flora 12(2) Erg.: 10. 1829.

Gymnostomum sect. *Pottia* Reichenb., Consp. Regn. Veg. 1: 33. 1828.

Habit: Erect, scattered to densely gregarious.

Colour: Green to yellowish green or yellowish brown with yellowish brown stems.

Stems: 3–5 mm high, erect, simple, rhizoids at base.

Leaves: Erect to erect-spreading, somewhat twisted and contorted when dry, concave to weakly keeled, lamina unistratose, 1–3 mm long, oblong-lanceolate to oblong-ovate, sometimes obovate, acute to shortly acuminate, often apiculate, nondecurrent. Perichaetial leaves similar to stem leaves but somewhat larger.

Leaf Margins: Plane or recurved near middle, entire, sometimes crenulate near apex.

Costae: Single, smooth, excurrent, often forming apiculus, somewhat prominent on dorsal surface, yellowish.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits. Median cells irregularly angled to hexagonal, becoming much larger near base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous, with perigonial buds at base of stems, or reported to be paroicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary or rarely 2 per perichaetium, on a seta arising from the stem apex, orange to brown, ovoid to obovoid, straight, erect, weakly striate when dry.

Setae: Straight to flexuose, smooth, not or slightly twisted when dry, yellowish to orange.

Annuli: 1 row of cells, persistent.

Opercula: Long-rostrate, arcuate.

Peristomes: Lacking or reported to be occasionally rudimentary, delicate, and papillose.

Spores: Yellowish brown to orange, globose, papillose, 19–28 μm.

1. **Pottia truncata** (Hedw.) Fürnr. *ex* B.S.G., Bryol. Eur. 2: 37. 120. 1843 (fasc. 18–20 Mon. 9.4).
Gymnostomum truncatum Hedw., Spec. Musc. 30. 1801.
[Synonym: *P. truncatula* (With.) Buse]
PLATE 120

Plants scattered to densely gregarious, stems 3–5 mm high; leaves erect to erect-spreading when moist, somewhat twisted and contorted when dry, oblong-lanceolate to oblong-ovate, sometimes obovate, acute to shortly acuminate, often apiculate, concave to weakly keeled, 1–3 mm long, margins plane or recurved near middle, entire or crenulate near apex, costae excurrent, often forming apiculus, smooth, leaf cells smooth, median cells irregularly angled to hexagonal, 14–33 μm in longest dimension; autoicous, capsules solitary or rarely 2 at stem apex, orange to brown, 0.5–1.0 mm long, ovoid to obovoid, straight, erect, weakly striate when dry, exserted on yellowish to orange setae, 2–4 mm long, opercula long-rostrate, 0.3–1.0 mm long; peristome lacking, spores 19–28 μm.

Habitat: On bare, often calcareous, soil in exposed situations, such as fields, pastures, and roadsides.

Maritime Distribution: Rare or seldom collected. Nova Scotia (Digby, Halifax, Hants, Kings).

Range: Nova Scotia to Ontario, south to Maryland and *Michigan; disjunct to Washington and British Columbia. South America, Europe, *Asia, *Africa, *Australia, *New Zealand.

Chromosome Number: n = 20, 25, 26, 52.

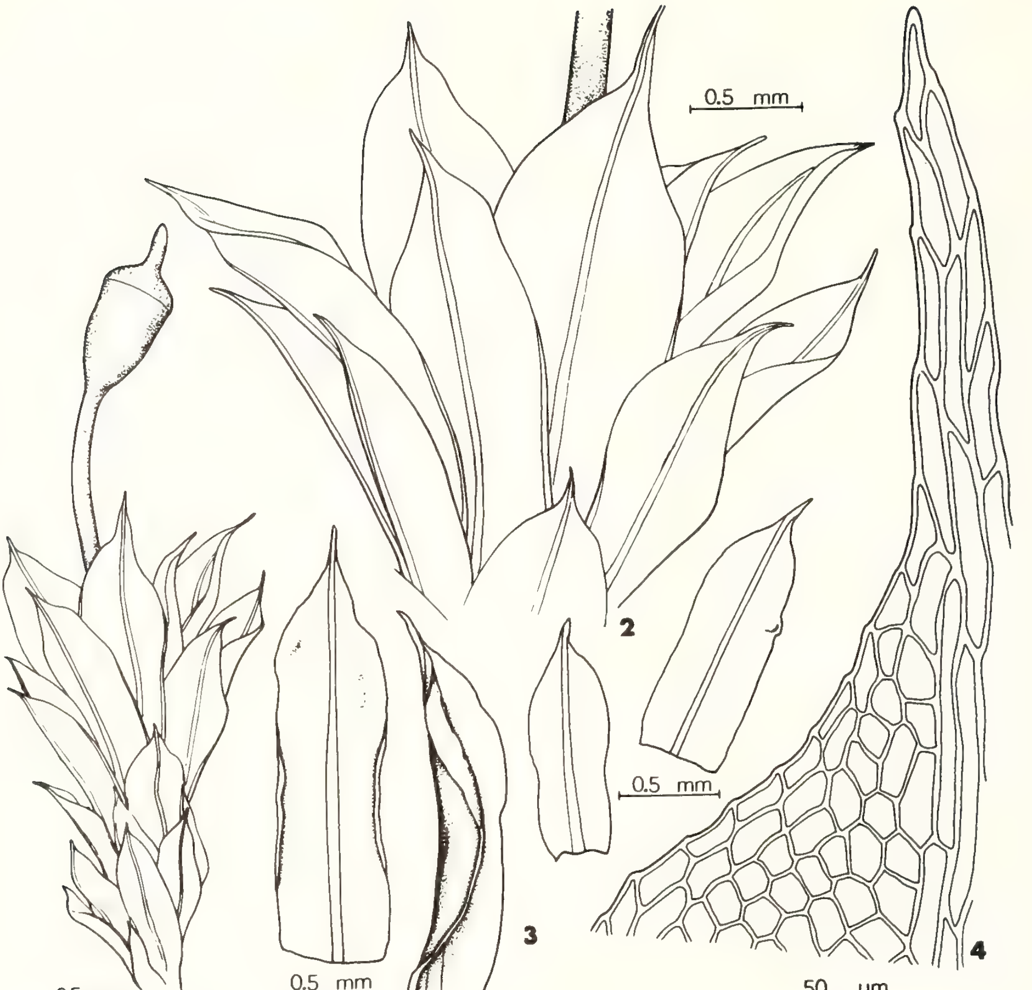
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Plate 120. *Pottia truncata*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (wet). 8. Spore.

12. **Desmatodon** Brid., Mant. Musc. 86. 1819.

Habit: In erect, loose to dense tufts, rarely occurring scattered.

Colour: Green to yellowish green, becoming brown below with age.

Stems: 3–12 mm high, erect, simple or rarely branching, rhizoids at base.

Leaves: Erect to erect-spreading, contorted when dry, concave to weakly keeled, lamina unistratose, sometimes bistratose on margins, lanceolate, ovate, oblong to lingulate, or spatulate, obtuse to apiculate or acute to acuminate, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or usually recurved in lower half, sometimes revolute nearly to apex, entire or serrulate to serrate by projecting cell ends near apex, often bordered in lower half with 1–2 layers of 1–5 rows of yellowish, thick-walled, square to rectangular or linear cells.

Costae: Single, subpercurrent to excurrent, smooth or papillose, slightly prominent on dorsal surface.

Leaf Cells: Smooth or densely papillose on both surfaces, the papillae appearing C-shaped, lacking on apical, basal and sometimes on border cells, thin-walled or thick-walled along margins. Median cells rhomboidal to hexagonal, sometimes quadrate, becoming longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or functionally dioicous after male branch becomes detached and separated from female organs on stem. Reported to be polyoicous.

Calyptrae: Cucullate, naked, yellowish with a darker tip, fugacious.

Capsules: Solitary, rarely 2, on a seta at stem apex, yellowish to reddish brown, ovoid and inclined to horizontal or cylindric to ovate and erect, straight to arcuate, smooth or weakly striate when dry.

Setae: Straight to flexuose, smooth, twisted when dry, yellowish to reddish brown.

Annuli: 1–2 rows of small cells, persistent.

Opercula: Short to long-rostrate, straight to arcuate.

Peristomes: Lacking or present, single, inserted below the mouth, consisting of 16, yellow, orange, or reddish brown, papillose teeth, not twisted, divided nearly to base into 2–3 filiform segments.

Spores: Yellow to brown, globose or ovoid, smooth to strongly papillose, 19–47 μm in longest dimension.

1. Leaves obtuse or ending in an apiculus, upper cells papillose; peristome present .... 1. *D. obtusifolius*
1. Leaves acute to acuminate, upper cells smooth or papillose; peristome present or lacking 2
    2. Leaves with smooth cells, the margins bordered in lower half by a band of 1–5 rows of yellowish, thick-walled, linear cells; capsules inclined to horizontal, arcuate 3
        3. Capsules with peristome teeth .... 3. *D. cernuus*
        3. Capsules lacking peristome teeth .... 4. *D. randii*
    2. Leaves with papillose cells, the papillae sometimes sparse or lacking on border cells which are yellowish, thick-walled, square to rectangular; capsules erect, straight .... 2. *D. heimii*

1. Desmatodon obtusifolius (Schwaegr.) Schimp., Syn. 158. 1860.

Barbula obtusifolia Schwaegr., Spec. Musc. Suppl. 1(1): 129. 1811.

PLATE 121

The obtuse leaves, sometimes ending in an apiculus, as well as the ever present peristome, will separate this species from the others.

Habitat: On soil over cliffs beside rivers, reportedly preferring calcareous substrates.

Maritime Distribution: Rare. New Brunswick (County unknown); Nova Scotia (Colchester).

Range: Greenland to Alaska, south to *New Jersey, Tennessee, Indiana, Missouri, Texas, Colorado, *Arizona, and *California. Europe, *Asia, *Africa.

Chromosome Number: n = 26.

Remarks: See *Barbula convoluta*.

2. Desmatodon heimii (Hedw.) Mitt., J. Linn. Soc. Bot. 8: 28. 1865.

Gymnostomum heimii Hedw., Spec. Musc. 32. 1801.

[Synonym: *Pottia heimii* (Hedw.) B.S.G.]

PLATE 122

Leaves acute to acuminate, cells papillose, margins bordered with one layer of 1–5 rows of square to rectangular, thick-walled, yellowish cells; capsules cylindric, erect, peristome lacking.

Habitat: On soil over rock, apparently in maritime habitats.

Maritime Distribution: Rare. New Brunswick (Restigouche). Known from a single collection at Campbellton by J. Macoun, 4 August 1882.

Range: Greenland and Newfoundland to Alaska, south to Quebec, *Ontario, Manitoba, Colorado, *New Mexico, Utah, and California. South America, Europe, *Asia, *New Zealand.

Chromosome Number: n = 26.

3. Desmatodon cernuus (Hüb.) B.S.G., Bryol. Eur. 2: 58. 134. 1843 (fasc. 18–20 Mon. 8.5).

Dermatodon cernuus Hüb., Musc. Germ. 117. 1833.

[Synonym: *Tortula cernua* (Hüb.) Lindb.]

PLATE 123

Leaves acute to apiculate, cells smooth, margins bordered in lower half by 1–2 layers of 2–5 rows of linear, thick-walled, yellowish cells; capsules ovoid, inclined to horizontal, peristome present.

Habitat: On soil over calcareous rock in maritime situations.

Maritime Distribution: Rare. New Brunswick (Restigouche); Nova Scotia (Halifax, St. Paul Island).

Range: Greenland and Newfoundland to *Alaska, south to Quebec, Ontario, *Ohio, Michigan, Illinois, Colorado, Utah, and *Nevada. Europe, *Asia.

Chromosome Number: n = 25, 26.

4. Desmatodon randii (Kenn.) Laz., Trudy Vseukrainsk. Ak. Nauk. Fiz. Nat. Viddielu 15(1): 13. 1929.

Pottia randii Kenn., Rhodora 1: 78. 1899.

[Synonym: *Entosthodon neoscoticus* M.S. Brown]

PLATE 124

Similar to *D. cernuus* but differing primarily in the lack of peristome teeth.

Habitat: On damp gravelly soil and in crevices in granite rocks.

Maritime Distribution: Rare. Nova Scotia (Halifax). Known only from a collection made by M.S. Brown (*485*) at Peggy's Cove, 19 September 1928 and described by her as a new species, *Entosthodon neoscoticus*.

Range: Nova Scotia, Alberta, Illinois, and Maine. Europe.

Chromosome Number: n = 26.

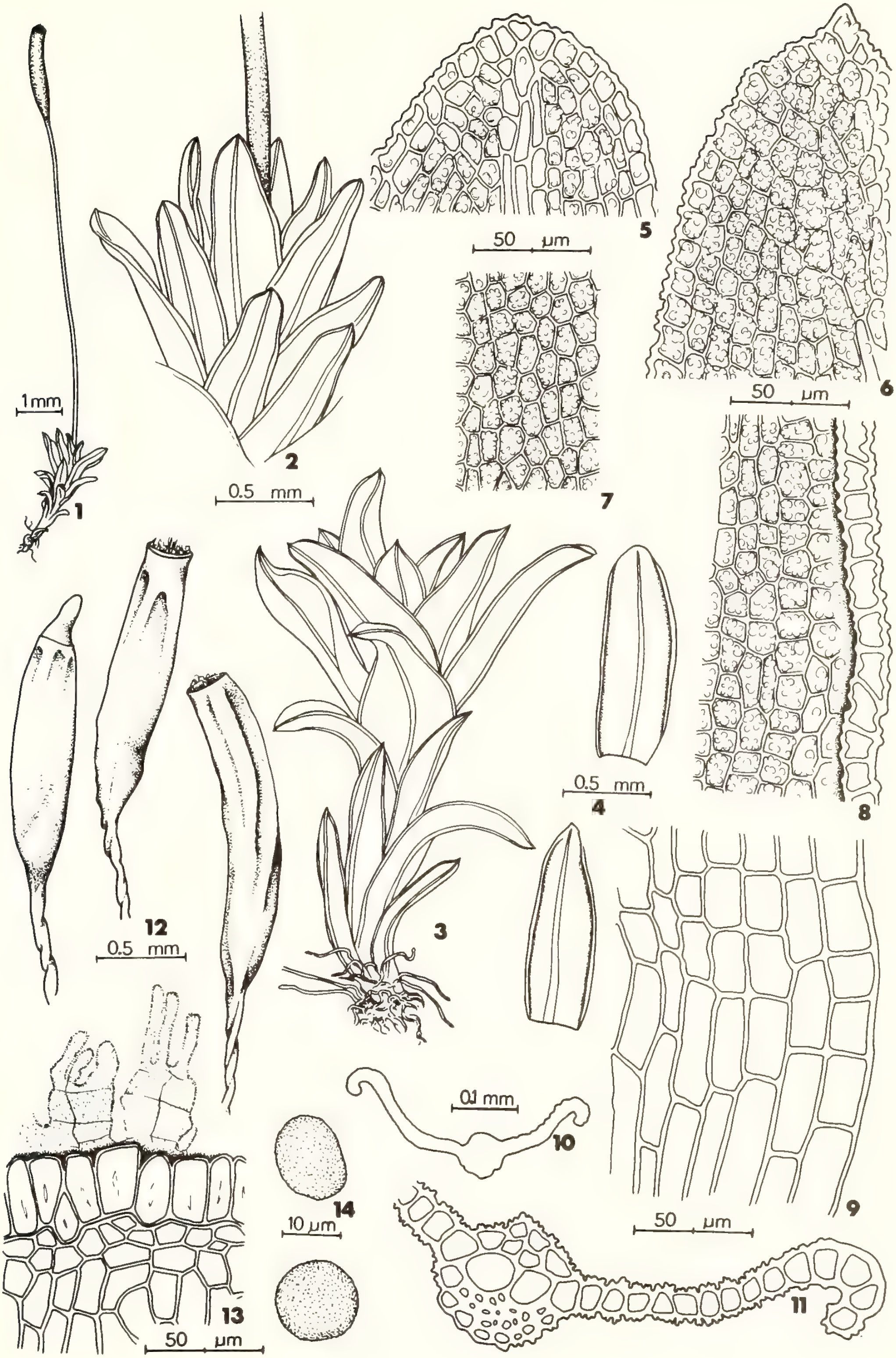
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Plate 121. *Desmatodon obtusifolius*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–9. Leaf cells (5–6, apical. 7, median. 8, median-marginal. 9, alar.). 10–11. Cross-sections of leaves near middle. 12. Capsules (dry). 13. Peristome teeth. 14. Spores.

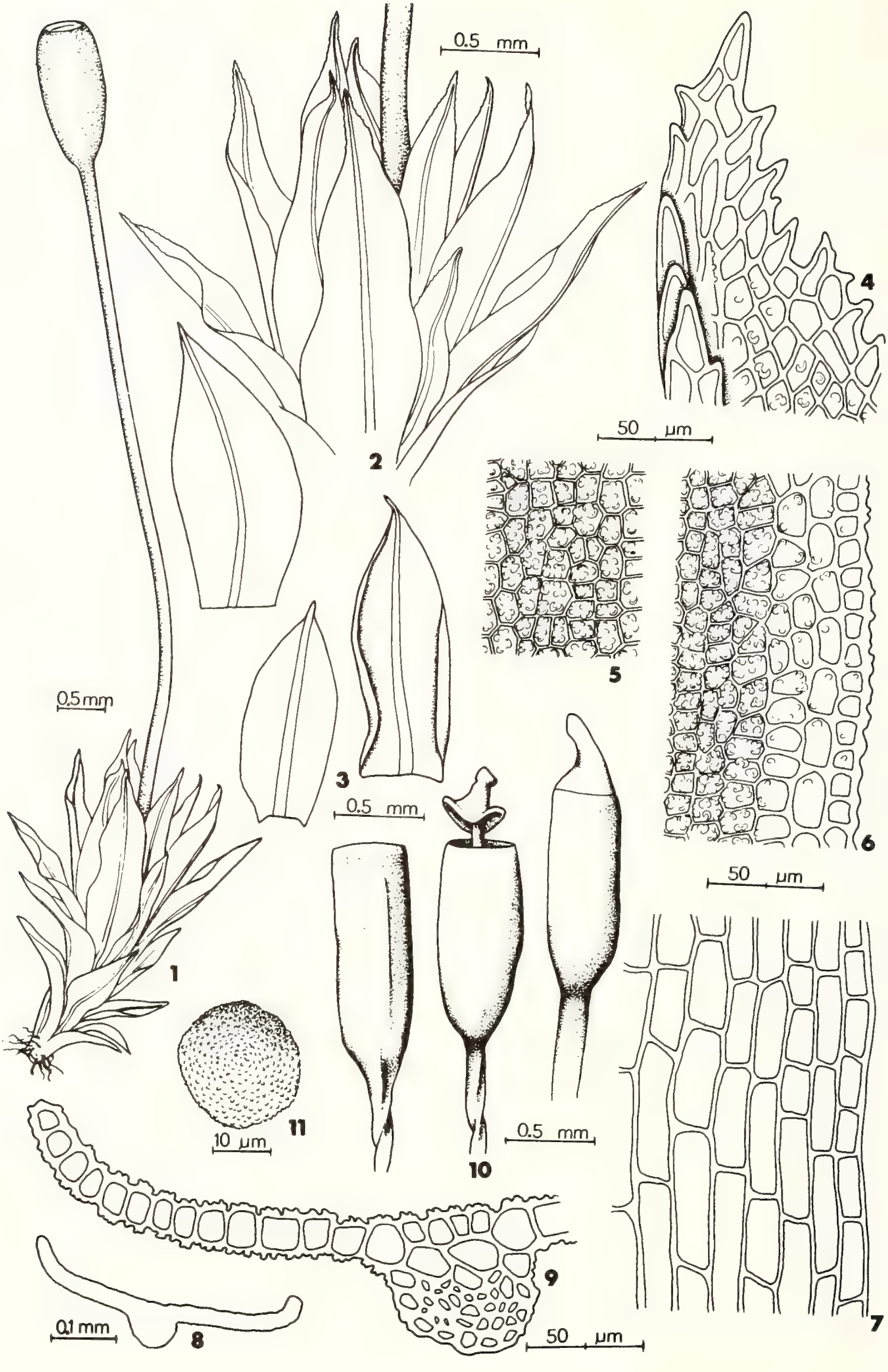
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Plate 122. *Desmatodon heimii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8–9. Cross-sections of leaves near middle. 10. Capsules (wet on right). 11. Spore.

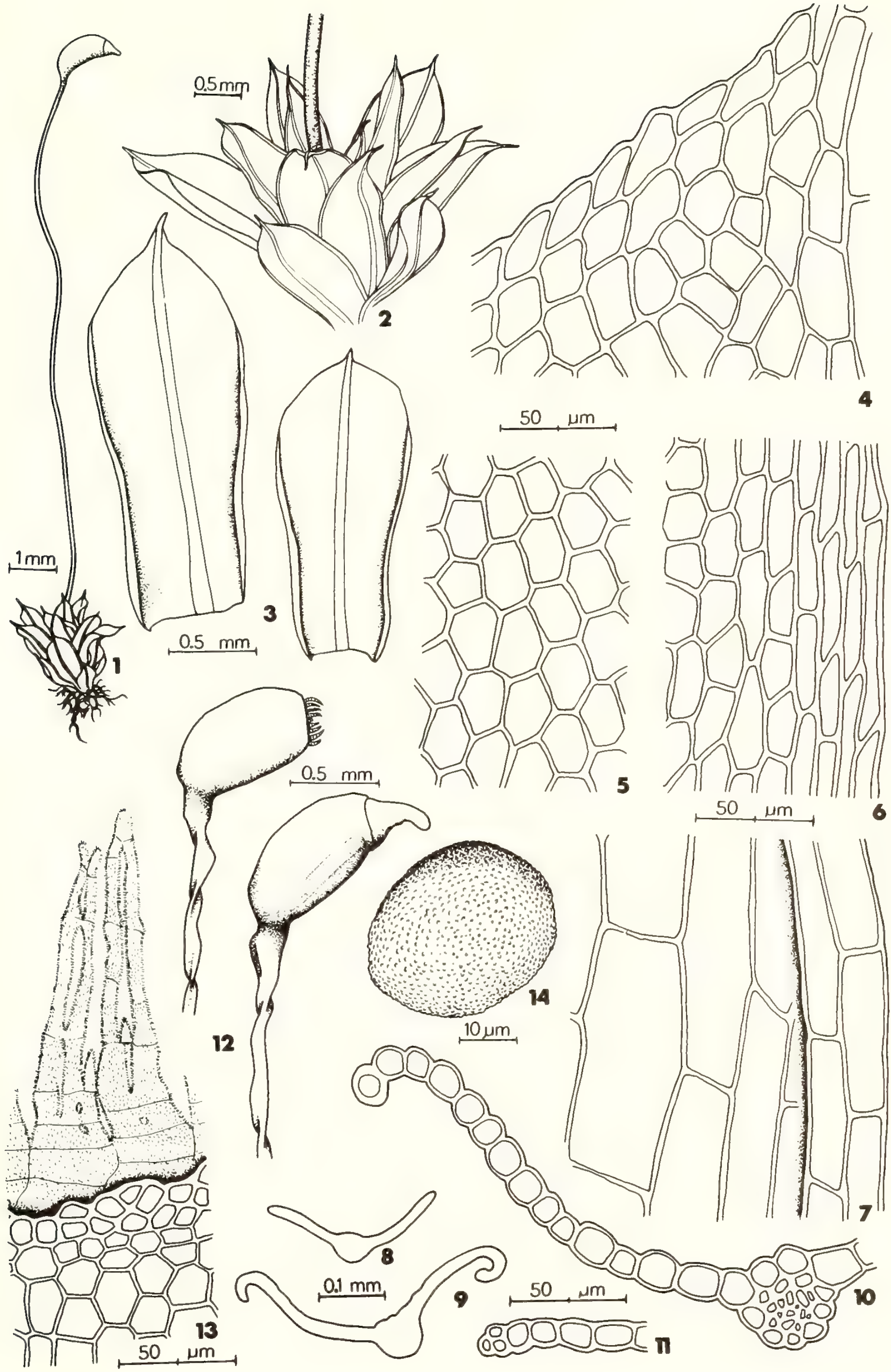
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Plate 123. *Desmatodon cernuus*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9–10. Cross-sections of leaves near middle. 11. Cross-section of leaf margin below middle. 12. Capsules (dry). 13. Peristome teeth. 14. Spore.

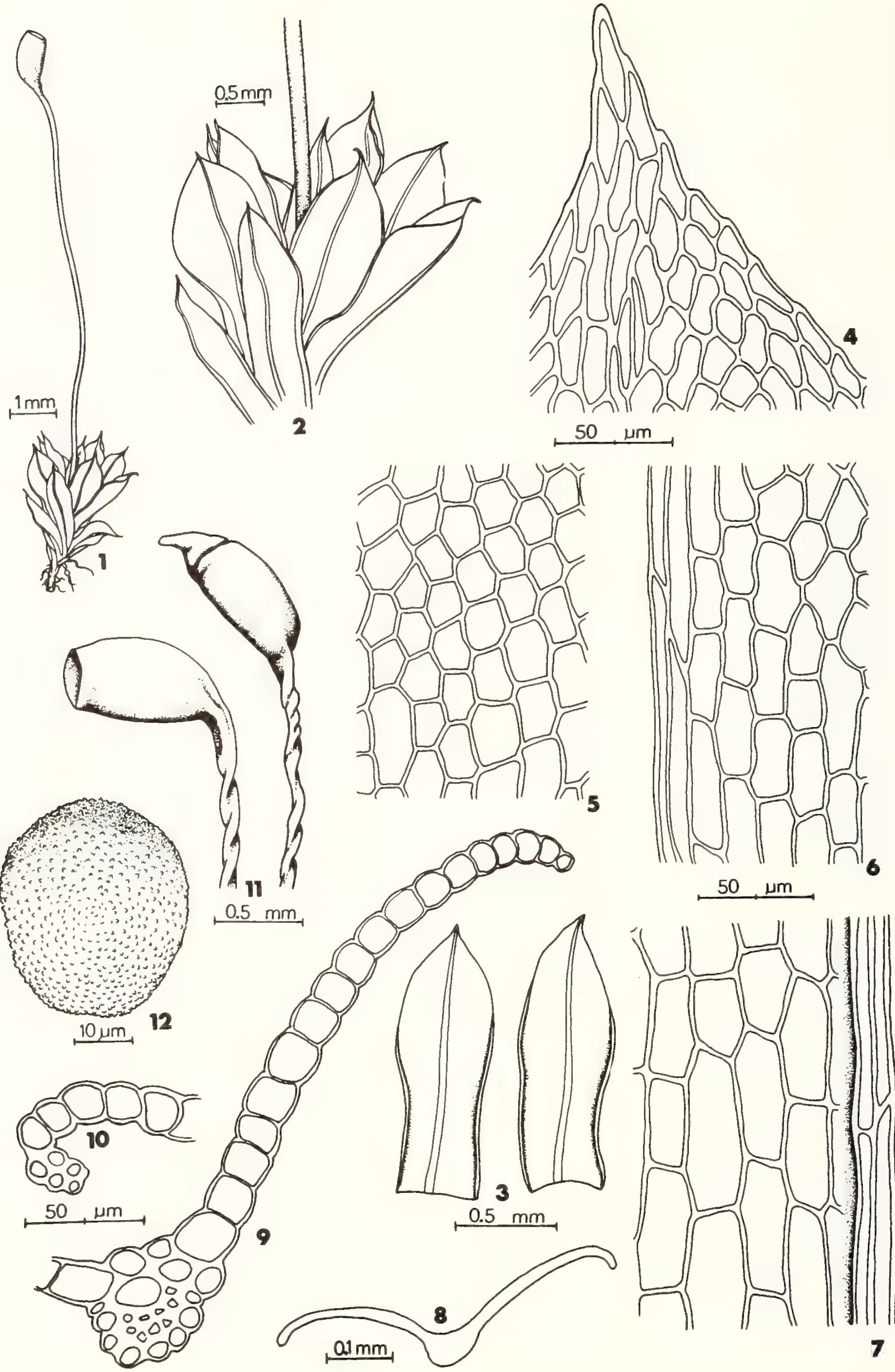
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Plate 124. *Desmatodon randii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8–9. Cross-sections of leaves near middle. 10. Cross-section of leaf margin below middle. 11. Capsules (dry). 12. Spore.

13. **Tortula** Hedw., Spec. Musc. 122. 1801. *nom. cons.*

Habit: Plants erect, in loose to dense tufts, sometimes scattered.

Colour: Dull or glaucous green above, often brown or reddish brown below.

Stems: 0.3–2.0 cm high, erect, simple or branched, rhizoids at base, sometimes extending a considerable distance above.

Leaves: Erect to squarrose, often imbricate and twisted or contorted when dry, keeled or concave, lamina unistratose, oblong, obovate, or spatulate, acute to obtuse, ending in a mucro or white, toothed awn, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Recurved to leaf middle or to apex, sometimes involute, entire or crenulate near apex.

Costae: Single, excurrent into smooth to serrulate mucro or toothed awn, prominent on dorsal surface.

Leaf Cells: Smooth or papillose, 1-several, rounded, branched, or C-shaped papillae on dorsal surface or on both surfaces, cell walls thin or thick on margins, lacking pits. Median cells hexagonal, irregularly angled or rectangular, sometimes collenchymatous, marginal cells sometimes differentiated, thick-walled, linear, rounded, or ellipsoidal, basal cells linear to rectangular, sometimes two large hyaline areas at base of lamina.

Asexual Reproductive Bodies: Lacking or present. Clusters of yellowish green, globose to ellipsoidal, smooth, multicellular propagules, occurring on short stalks on ventral surface of costae.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, cylindric, straight to slightly arcuate, erect, smooth.

Setae: Straight to flexuose, smooth, twisted when dry, brown to reddish brown.

Annuli: 1–3 rows of cells, persistent.

Opercula: High-conic, straight to somewhat arcuate.

Peristomes: Single, consisting of 16, pink or orange, papillose teeth, twisted, divided above into 32 filiform segments, arising from a whitish, high, tesselated tube.

Spores: Yellow to greenish yellow, globose to ovoid, minutely papillose, 7–28 μm in longest dimension.

1. Leaf apices ending in a long, sharply toothed awn; leaf cells multipapillose .... 3. *T. ruralis*
1. Leaf apices acute or mucronate, entire or serrulate; leaf cells smooth or unipapillose 2
    2. Leaf margins inrolled; globose or ellipsoidal gemmae on upper surface of costae; occurring on tree trunks .... 1. *T. papillosa*
    2. Leaf margins recurved; propagula lacking; occurring on soil and rocks .... 2. *T. mucronifolia*

1. Tortula papillosa Wils. *ex* Spruce, London J. Bot. 4: 193. 1845.
PLATE 125

Small plants, stems 3–5 mm high, with acute to mucronate leaves, entire, inrolled margins, leaf cells smooth or unipapillose, bearing globose or ellipsoidal propagula on the upper surface of the costa.

Habitat: On tree trunks, especially on elm and willow in the Maritimes.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Hants).

Range: Known in Canada only from Nova Scotia and Ontario; in the United States from Massachusetts, Connecticut, New Jersey, Maryland, Virginia, Ohio, Michigan, Indiana, Missouri, Colorado, New Mexico, Arizona, and California. Also known from *Georgia, *Illinois, *New York, *Pennsylvania, *South Carolina, and *Tennessee. Mexico, South America, Europe, *Africa, *Australia, New Zealand.

Chromosome Number: n = 12.

Remarks: The Maritime plants are sterile and according to Schnooberger (1942), *T. papillosa* is known in fruiting condition only from Tasmania and Australasia.

2. Tortula mucronifolia Schwaegr., Spec. Musc. Suppl. 1(1): 136. 1811.

PLATE 126

Plants with stems 3–15 mm high, acute to mucronate leaves, margins entire or crenulate near apex, recurved from base to leaf middle or somewhat above, smooth leaf cells; autoicous, often producing sporophytes.

Habitat: On soil, apparently calcareous, in crevices of cliffs, over boulders, or over rotten logs.

Maritime Distribution: Rare. New Brunswick (Restigouche, Victoria); Nova Scotia (Colchester, Kings).

Range: Greenland to Alaska, south to New York, Michigan, Wisconsin, Iowa, Nebraska, New Mexico, Arizona, and California. Europe, *Asia, *Africa.

Chromosome Number: n = 12, 24, 26, 30.

3. Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb., Oek. Techn. Fl. Wetterau 3(2): 91. 1802.

Barbula ruralis Hedw., Spec. Musc. 121. 1801.

PLATE 127

The leaves with multipapillose cells and a costa that is excurrent into a toothed, hyaline awn is enough to distinguish this species from the other *Tortula* species in the Maritimes.

Habitat: Not reported for the single specimen examined but apparently occurring on sandy soil. Reported from elsewhere on soil or rocks in dry, sunny, calcareous habitats, often on sand along shores of lakes.

Maritime Distribution: Rare. Nova Scotia (Victoria). Known from only a single collection by G.E. Nichols (*1807*) in the vicinity of Barrasois River, August 1909 (FH).

Range: Greenland to Alaska, south to New York, Michigan, Missouri, South Dakota, New Mexico, Arizona, and California. Mexico, *South America, Europe, Asia, *Africa, *Australia, Pacific Islands. In North America it is much more common in Michigan and westward.

Chromosome Number: n = 12.

Remarks: The apparent rarity of this species in the Maritimes is difficult to explain and it does not seem to be the result of inadequate collections. It is an easily recognized moss and one that is large enough (reported up to 8 cm) to draw the attention of even an inexperienced collector. It is apparently rare throughout the eastern third of North America.

Capsules drawn from Newfoundland plants.

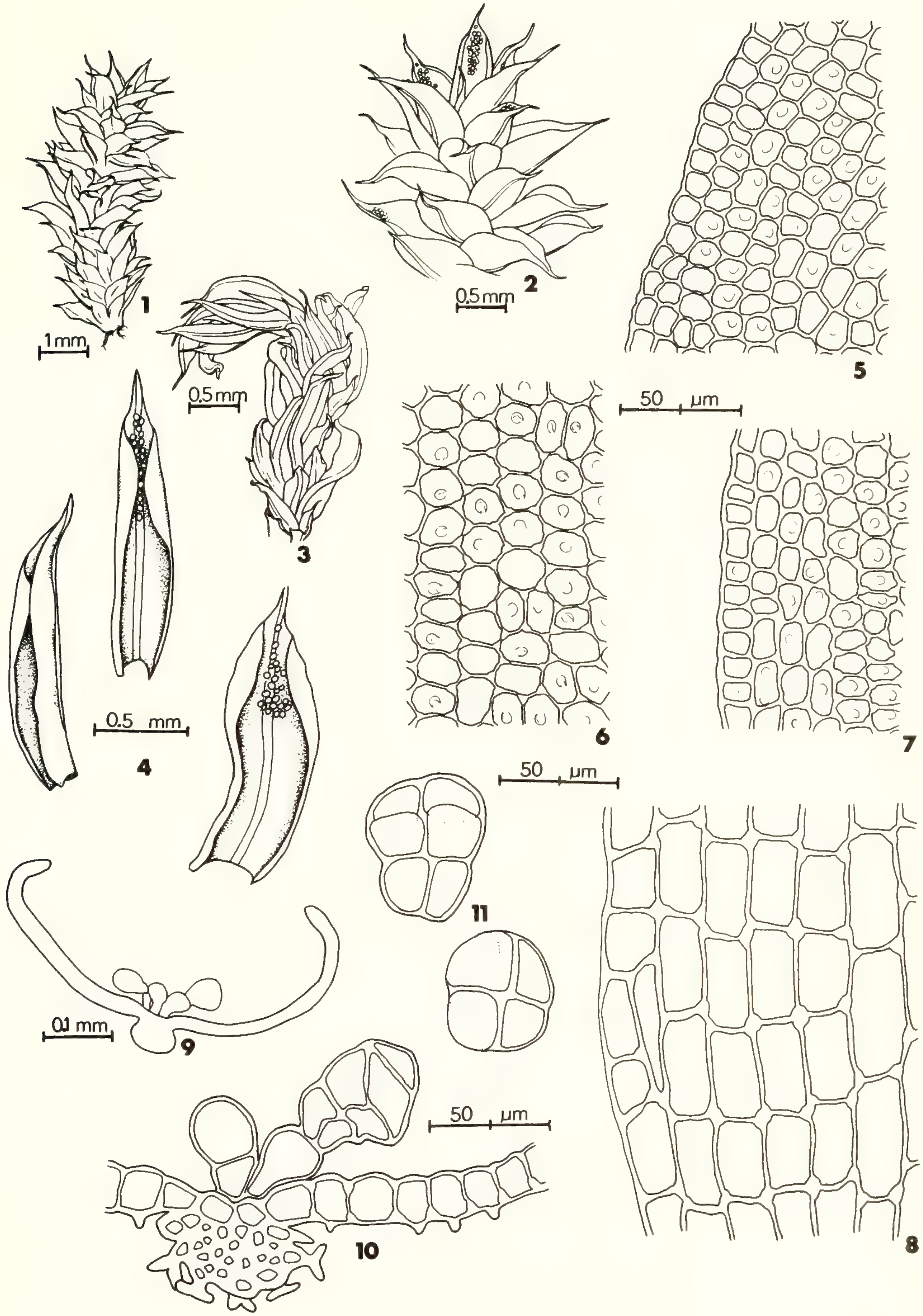
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Plate 125. *Tortula papillosa*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9–10. Cross-sections of leaves above middle. 11. Gemmae.

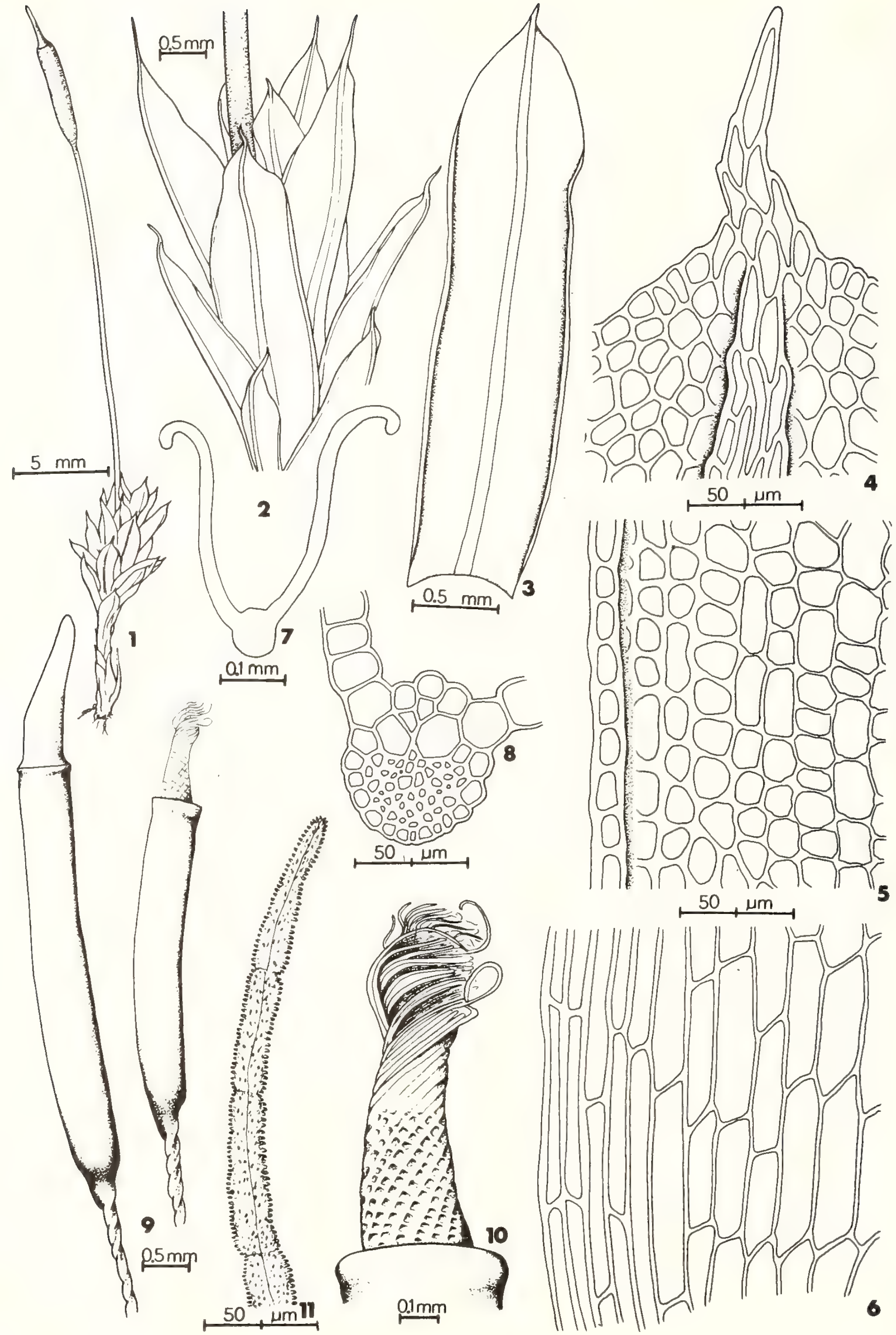
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Plate 126. *Tortula mucronifolia*. 1. Habit. 2. Portion of stem. 3. Leaf. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Cross-section of leaf near middle. 8. Cross-section of costa near middle. 9. Capsules (dry). 10. Peristome. 11. Enlargement of apical portion of peristome tooth.

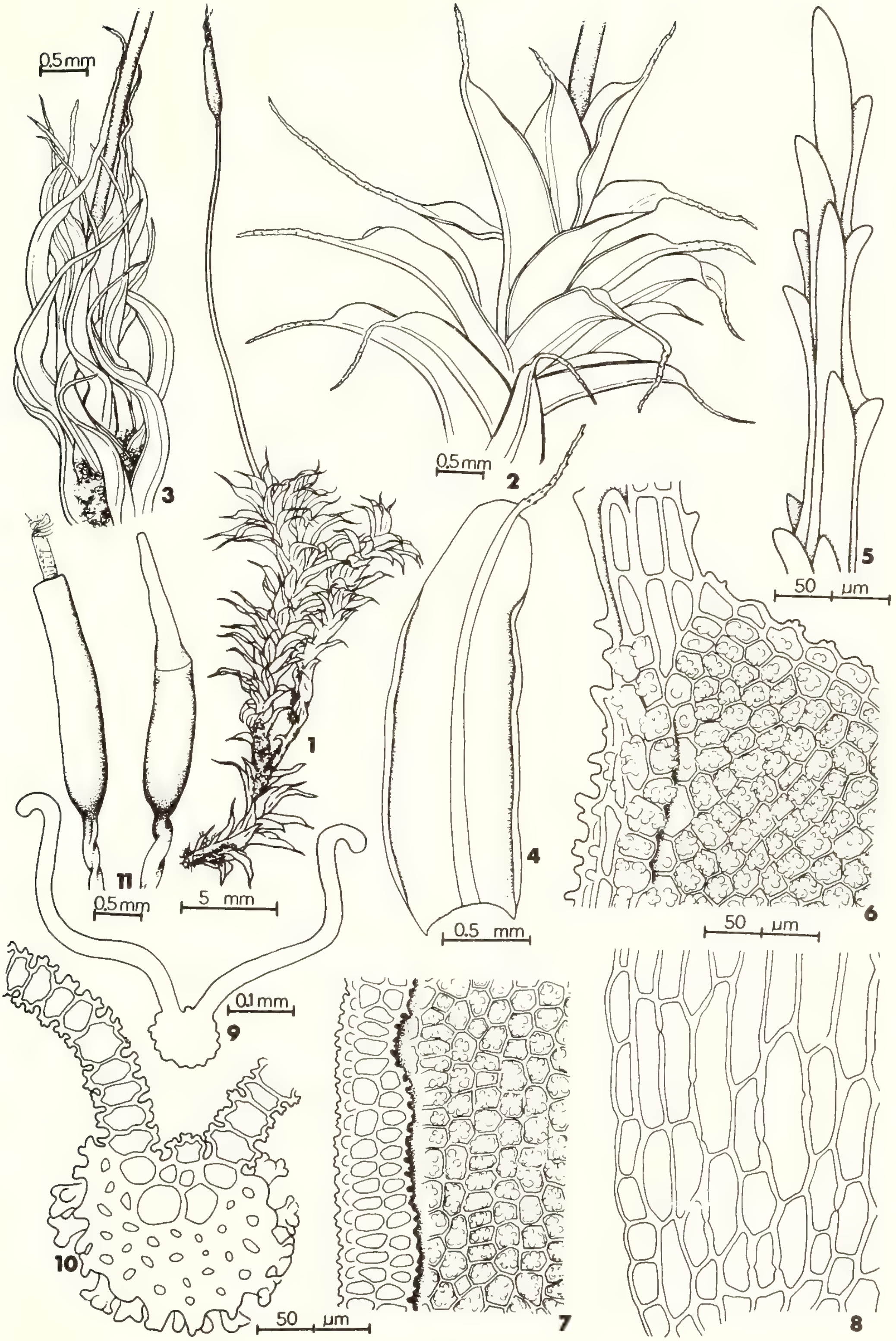
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Plate 127. *Tortula ruralis*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaf. 5. Enlargement of apical portion of leaf awn. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near middle. 10. Cross-section of costa near middle. 11. Capsules (dry).

Family GRIMMIACEAE

1. Basal leaf cells thin to thick-walled, with straight to slightly sinuose walls; capsules immersed or exserted .... 1. *Grimmia* (p. 244)
1. Basal leaf cells thick-walled and strongly sinuose-nodulose; capsules exserted .... 2. *Rhacomitrium* (p. 257)

1. **Grimmia** Hedw., Spec. Musc. 75. 1801.
[Synonym: *Schistidium* Brid.]

Habit: In erect, loose to dense tufts.

Colour: Dark green, brown, reddish brown or black.

Stems: 0.5–5.0 cm high, erect, branched or sometimes simple, rhizoids at base.

Leaves: Erect-spreading to spreading and nearly squarrose, erect, sometimes imbricate or somewhat contorted when dry, rarely appearing in definite rows, concave or keeled, unistratose or bistratose, rarely tristratose above, usually on margins, linear-lanceolate, lanceolate, ovate, or ovate-lanceolate, acute to acuminate, often ending in a serrulate to serrate, hyaline awn, 1/4 length of leaf or more, nondecurrent or shortly decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Recurved on one or both sides, often to near apex, sometimes plane or involute, entire to serrate above, entire below.

Costae: Single, subpercurrent, often extending into base of awn, smooth or papillose on dorsal surface near apex.

Leaf Cells: Smooth, mammillose or with cuticular ridges, the walls usually thick, lacking pits, sometimes weakly sinuose. Median cells quadrate, hexagonal, irregularly angled, rounded, or transversely elongate, quadrate to rectangular below.

Asexual Reproductive Bodies: Usually lacking, when present, in globose, dark green clusters at tips of blunt, deformed upper leaves.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate or mitrate, naked, fugacious.

Capsules: Solitary, immersed or exserted on a short or long seta from the stem apex, brown or reddish brown, ellipsoidal to ovoid, sometimes cylindric or globose, straight, erect, rarely inclined, smooth or ridged.

Setae: Short or elongate, straight or arcuate, smooth, sometimes twisted when dry, brown or reddish.

Annuli: Present, of 2–3 rows of cells, persistent, rarely lacking.

Opercula: Rostrate, rarely conic, straight.

Peristomes: Single, rarely lacking, consisting of 16, red, papillose teeth, divided to near the middle into 2–3 segments.

Spores: Yellow to greenish or brownish yellow, globose to ovoid, smooth or minutely papillose, 7–24 μm in longest dimension.

1. Leaves (mainly the upper ones) with a hyaline mucro or awn; capsules immersed or exserted .. 2
    2. Leaves with margins plane or involute 3
        3. Leaves spreading to nearly squarrose; capsules exserted; peristome present .... 7. *G. olneyi*
        3. Leaves imbricate; capsules immersed; peristome lacking ..... 5. *G. anodon* (in part)
    2. Leaves with one or both margins recurved 4
        4. Upper leaves often obtuse, bearing clusters of gemmae at their tips .... 8. *G. hartmanii* var. *anomala*
        4. Upper leaves acute to acuminate, lacking gemmae 5
            5. Leaves with a long awn, often 1/4 the length of the leaf or more 6
                6. Lower leaf cells sinuose, the marginal cells at the leaf base with cross-walls thicker than the longitudinal walls; capsules exserted on prominent setae; peristome teeth present .... 6. *G. affinis*

6. Lower leaf cells not sinuose, or, if so, the walls all about the same thickness; capsules immersed and setae not evident; peristome teeth present or lacking 7
7. Leaves mostly in definite rows; peristome teeth lacking . . . . 5. *G. anodon* (in part)
7. Leaves not in definite rows; peristome teeth present . . . . 4. *G. apocarpa*
5. Leaves with a mucro or short awn less than 1/4 the length of the leaf 8
8. Leaves papillose on dorsal surface of costa near apex . . . . 4a. *G. apocarpa* var. *gracilis* (in part)
8. Leaves smooth on dorsal surface of costa . . . . 3. *G. rivularis* (in part)
1. Leaves lacking hyaline mucro or awn; capsules immersed 9
9. Leaves ovate-lanceolate, acute or narrowly obtuse, serrate to serrulate at apex 10
10. Leaves papillose on dorsal surface of costa near apex . . . . 4a. *G. apocarpa* var. *gracilis* (in part)
10. Leaves smooth on dorsal surface of costa . . . . 3. *G. rivularis* (in part)
9. Leaves ligulate to linear-lanceolate, rarely ovate-lanceolate, mostly obtuse, sometimes acute, entire or crenulate at apex 11
11. Leaf apex narrowly obtuse, sometimes acute, leaves not eroded; maritime plants growing on rocks in the spray zone . . . . 1. *G. maritima*
11. Leaf apex broadly obtuse, the leaves often eroded; plants not maritime, on rocks in or by streams . . . . 2. *G. agassizii*

1. Grimmia maritima Turn., Musc. Hib. 23. 1804. [Synonym: *Schistidium maritimum* (Turn.) B.S.G.]
PLATE 128

Plants in dense tufts, stems to 2 cm high; leaves 2–4 mm long, linear-lanceolate, apex narrowly obtuse to acute, margins plane above, usually recurved below, lamina bistratose or rarely tristratose in streaks above, leaf cells quadrate, transversely elongate or rounded above, quadrate to rectangular below, walls not sinuose; capsules ovoid, immersed in the upper leaves on short setae, peristome teeth present.

Habitat: On boulders and in cliff crevices beside the ocean.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Queen's, Restigouche); Nova Scotia (Cape Breton, Cumberland, Digby, Halifax, Inverness, Kings, Victoria, Yarmouth).

Range: A maritime moss occurring in the spray zone on both coasts. Seen along the eastern seaboard from Newfoundland, Quebec, New Brunswick, Nova Scotia, Maine, and Massachusetts; on the western seaboard known from Alaska to California. A collection from Ontario (CANM) has probably been mislabelled. Europe, *Central and *South America.

Chromosome Number: n = 13.

2. Grimmia agassizii (Sull. & Lesq. *ex* Sull.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1872–73: 66. 1874.
Schistidium agassizii Sull. & Lesq. *ex* Sull., Musci Hep. U.S. 104. 1856.
[Synonyms: *G. alpicola* Hedw.; *G. apocarpa* var. *alpicola* (Hedw.) Röhl.; *Schistidium alpicola* (Hedw.) Limpr.]
PLATE 129

Plants in loose tufts, stems to 2 cm high; leaves 1.5–3.5 mm long, linear-lanceolate to ligulate, apex obtuse, rarely broadly acute, margins plane to narrowly recurved near base, lamina unistratose, sometimes bistratose above on or near margins, lower leaves often eroded with only costae remaining, leaf cells quadrate to rounded above, quadrate to short-rectangular below, walls sometimes sinuose; capsules ovoid, immersed in the upper leaves on short setae, peristome teeth present.

Habitat: On boulders in or beside streams.

Maritime Distribution: Rare or seldom collected. New Brunswick (Albert, Charlotte, Victoria); Nova Scotia (Lunenburg, Richmond).

Range: Labrador to *Alaska and British Columbia, south to Maine, New York, Michigan, and in the mountains to Colorado and *Utah. Europe.

Chromosome Number: Unreported.

Remarks: I am following Bremer (1980a) in employing the name *G. agassizii* for this distinct species. Bremer recently discovered that the type specimen of *G. alpicola* Hedw. is actually *G. agassizii*. However, the specific epithet *alpicola*, which is the oldest name, is not used instead of *agassizii* because *G. alpicola* was erroneously used for another species correctly named *G. rivularis*. Therefore, in accordance with the International Code of Botanical Nomenclature Art. 69, Bremer has proposed that the name *G. alpicola* be rejected since it is a source of constant error. Bremer (1980b) later revised *G. agassizii* and some other taxa placed in the segregate genus *Schistidium*.

3. **Grimmia rivularis** Brid., J. f. Bot. 1800(1): 276. 1801.
[Synonyms: *G. alpicola auct. non* Hedw.; *G. alpicola* var. *rivularis* (Brid.) Wahlenb.; *Schistidium alpicola* var. *rivulare* (Brid.) Limpr.; *Schistidium rivulare* (Brid.) Podp.; *G. helvetica* Schkuhr.; *Schistidium helveticum* (Schkuhr) Deguchi]
PLATE 130

Plants in loose to dense tufts, stems to 3 cm high; leaves 1.5–3.0 mm long, ovate to ovate-lanceolate, narrowly obtuse to acute, many of the upper leaves ending in a hyaline, serrulate mucro, sometimes all leaves on plants lacking hyaline mucro, margins recurved nearly to apex, entire or serrulate near apex, lamina unistratose, often bistratose above on margins, leaf cells rounded to irregularly angled above, rectangular below, walls not sinuose; capsules ellipsoidal to ovoid, immersed in the upper leaves on short setae, peristome teeth present.

Habitat: On exposed boulders or rock ledges in or beside streams or in dry woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Queen's, Restigouche, Victoria, Westmorland, York); Nova Scotia (Cape Breton, Colchester, Digby, Halifax, Hants, Kings, Lunenburg, Inverness, Pictou, Victoria); Prince Edward Island (Kings).

Range: Greenland to Alaska, south to North Carolina, Kentucky, Louisiana, Kansas, New Mexico, Arizona, and California. Europe, *South America, Asia, *Africa.

Chromosome Number: n = 13, 14.

4. **Grimmia apocarpa** Hedw., Spec. Musc. 76. 1801.
[Synonyms: *Schistidium apocarpum* (Hedw.) B.S.G.; *G. apocarpa* var. *ambigua* (Sull.) G. Jones; *Schistidium ambiguum* Sull.; *G. conferta* Funck]
PLATE 131

Plants in loose to dense tufts, stems to 2 cm high; leaves 1.0–2.5 mm long, lanceolate to ovate-lanceolate, many of the upper ones ending in a hyaline, serrate to serrulate awn, often 1/4 length of leaf, the lower ones acute, margins recurved nearly to apex, entire or serrulate near apex, lamina unistratose, often bistratose above on margins, leaf cells quadrate, irregularly angled or rounded above, quadrate to rectangular below, walls not or sometimes sinuose; capsules ellipsoidal to ovoid, immersed in the upper leaves on short setae, peristome teeth present.

Habitat: On exposed, usually dry, noncalcareous rock.

Maritime Distribution: Common. New Brunswick (Charlotte, Madawaska, Saint John, York); Nova Scotia (Annapolis, Cumberland, Digby, Halifax, Kings, Victoria).

Range: Greenland to Alaska, south to North Carolina, Alabama, Louisiana, Texas, *New Mexico, Arizona, and California. Central and South America, Europe, Asia, Africa, *Australia, New Zealand, *Pacific Islands.

Chromosome Number: n = 12, 13, 14, 26.

4a. **Grimmia apocarpa** var. **gracilis** Röhl., Deutschl. Fl. Krypt. ed. 2,3: 47. 1813.
[Synonyms: *G. gracilis* Schleich. *ex* Schwaegr.; *G. stricta* Turn.; *G. apocarpa* var. *stricta* (Turn.) Hook. & Tayl.]
PLATE 132

Plants similar to var. *apocarpa* except the stems are higher, up to 5 cm, and the costae are papillose on the dorsal surface near the apex. The other *Grimmia* taxa in the Maritimes have costae that are smooth on the dorsal surface.

Habitat: On rock, often in or beside streams.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Restigouche, Victoria); Nova Scotia (Annapolis, Cape Breton, Colchester, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Pictou, Shelburne, Victoria).

Range: Labrador to Alaska, south to North Carolina, Tennessee, Minnesota, Texas, Colorado, Arizona, and California. Europe, Asia.

Chromosome Number: n = 13.

5. Grimmia anodon B.S.G., Bryol. Eur. 3: 110. 236. 1845 (fasc. 25–28 Mon. 8.1).
[Synonym: *Schistidium anodon* (B.S.G.) Loeske]
PLATE 133

Plants in dense tufts, stems to 1.4 cm high; leaves 1.5–3.0 mm long, usually in definite rows, ovate to ovate-lanceolate, upper ones ending in a long, hyaline, serrulate awn, $^1/_4$–$^1/_2$ length of leaf, margins plane or recurved, lamina bistratose above, leaf cells quadrate to short-rectangular above, rectangular below, walls not sinuose, about equal in thickness; capsules nearly globose to ovoid, immersed in the upper leaves on short setae, peristome teeth lacking.

Habitat: On exposed calcareous rocks.

Maritime Distribution: Rare and possibly adventive. New Brunswick (Saint John). Known only from a few specimens by T.P. James collected in August 1870 and 1872 in St. John (FH).

Range: Predominantly western in distribution, occurring from the Yukon Territory to Saskatchewan, south to California, Nevada, Arizona, and New Mexico; disjunct to Ontario, Quebec, and New Brunswick. Europe, *Asia, *Africa.

Chromosome Number: n = 13, 26.

6. Grimmia affinis Hoppe & Hornsch. *ex* Hornsch., Flora 2: 85. 1819.
PLATE 134

Plants in dense tufts, stems to 2 cm high; leaves 1.5–2.5 mm long, ovate-lanceolate, the upper ones ending in a long, hyaline, serrulate awn, $^1/_4$–$^1/_2$ length of leaf, margins recurved on one side, lamina bistratose above, leaf cells quadrate, irregularly angled or rounded above, quadrate to rectangular below, walls often sinuose, marginal cells at leaf base with horizontal walls thicker than vertical walls; capsules ovoid to cylindric, exserted above the leaves on long, straight setae, 1–2 mm long, peristome teeth present.

Habitat: On dry, exposed rock, both noncalcareous and calcareous.

Maritime Distribution: Rare or seldom collected. New Brunswick (Victoria); Nova Scotia (Cape Breton, Halifax, Hants, Inverness).

Range: Greenland to *Alaska and British Columbia, south to the northern tier of States and in the mountains to Colorado, Arizona, and Nevada. Central and *South America, Europe, Asia, *Africa.

Chromosome Number: n = 13.

7. Grimmia olneyi Sull., Man. Bot. No. U.S. ed. 2: 637. 1856.
PLATE 135

Plants in loose tufts, stems to 2 cm high; leaves 2–3 mm long, linear-lanceolate with an ovate base, upper ones ending in a short, hyaline, serrulate awn, $^1/_4$ or less length of leaf, margins plane or involute, lamina often bistratose above, rarely tristratose, leaf cells hexagonal to rounded or sometimes transversely elongate above, quadrate to rectangular below, walls not sinuose, horizontal walls often thicker than vertical walls; capsules ellipsoidal to ovoid, exserted above the leaves on long, arcuate setae, 2–3 mm long, peristome teeth present.

Habitat: On noncalcareous rock.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Halifax, Queens).

Range: Endemic to North America from Nova Scotia to southern Quebec and Ontario, south to North Carolina, *Georgia, Indiana, and Missouri.

Chromosome Number: Unreported.

8. Grimmia hartmanii var. **anomala** (Hampe *ex* Schimp.) Mönk., Laubm. Eur. 369. 1927.
Grimmia anomala Hampe *ex* Schimp., Syn. ed. 2: 270. 1876.
PLATE 136

Plants in loose tufts, stems to 2 cm high; leaves 1–2 mm long, lanceolate, without a hyaline awn or a few upper leaves with a short awn, the apices of many upper leaves blunt and deformed, globose clusters of dark green gemmae often present at tips, margins recurved on one of both sides, lamina sometimes bistratose above, especially on margins, leaf cells quadrate, irregularly angled or short-rectangular above, with slightly sinuose walls, covered with longitudinal cuticular ridges, basal cells rectangular; capsules unknown on Maritime plants, reported to be cylindric, exserted above leaves on long, arcuate setae, 3–5 mm long, peristome teeth present.

Habitat: On noncalcareous boulder beside river.

Maritime Distribution: Rare. Nova Scotia (Lunenburg). Collected along the Gold River, 4.8 km south of Beech Hill, 20 July 1974 (*Ireland 17593*).

Range: A western moss occurring in British Columbia, Alberta, Washington, Idaho, Montana, Colorado, Wyoming, and *Utah; disjunct to Michigan, Ontario, *Newfoundland, and Nova Scotia. Europe, *Asia.

Chromosome Number: Unreported.

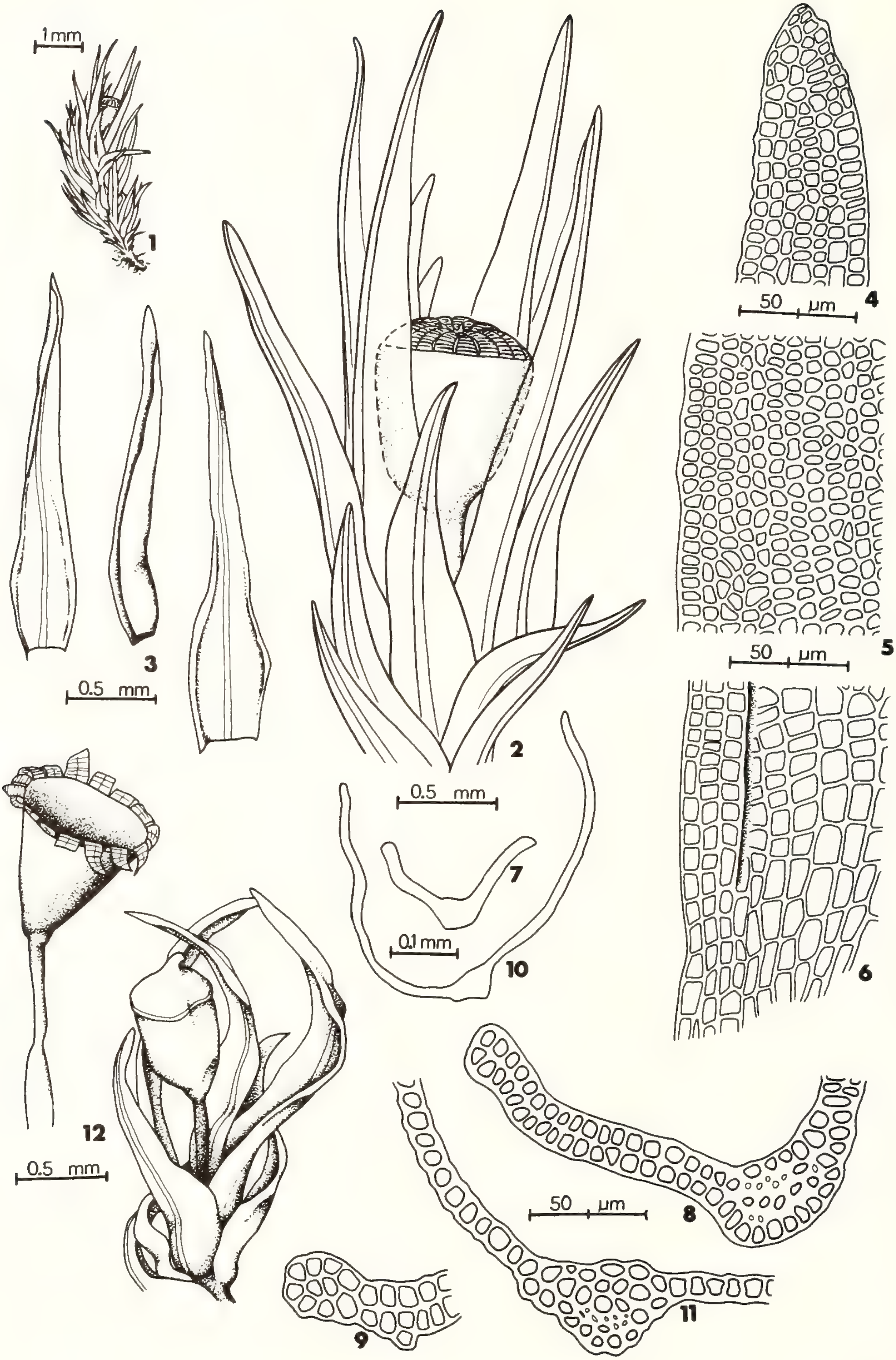
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Plate 128. *Grimmia maritima*. 1. Habit. 2. Portion of stem with capsule and perichaetial leaves. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7–8. Cross-sections of leaves near apex. 9. Cross-section of marginal cells near apex. 10. Cross-section of leaf near base. 11. Cross-section of costa near base. 12. Capsules (dry).

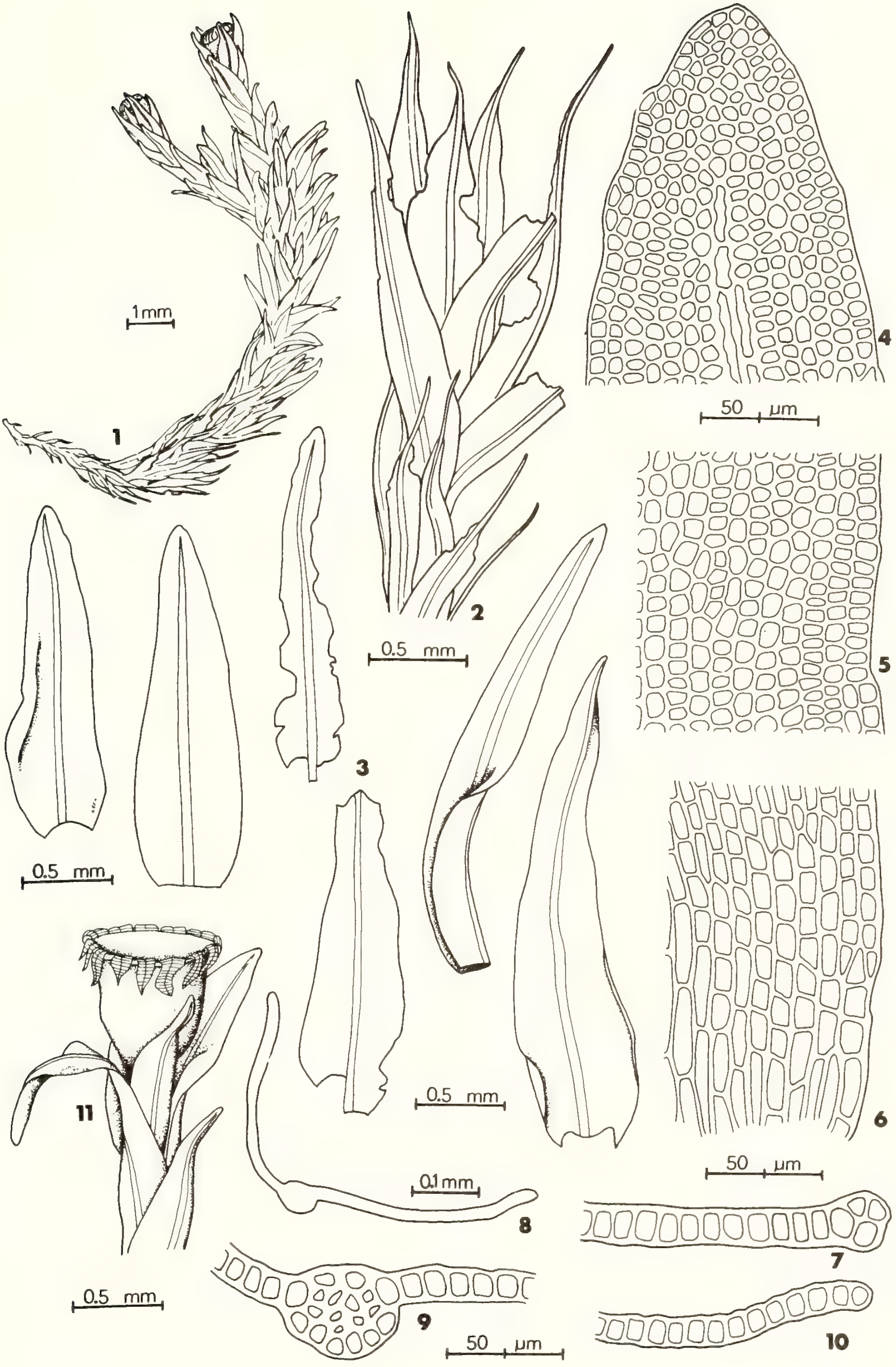
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Plate 129. *Grimmia agassizii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Cross-section of marginal cells above middle. 8. Cross-section of leaf below middle. 9. Cross-section of costa below middle. 10. Cross-section of marginal cells below middle. 11. Capsule with perichaetial leaves (dry).

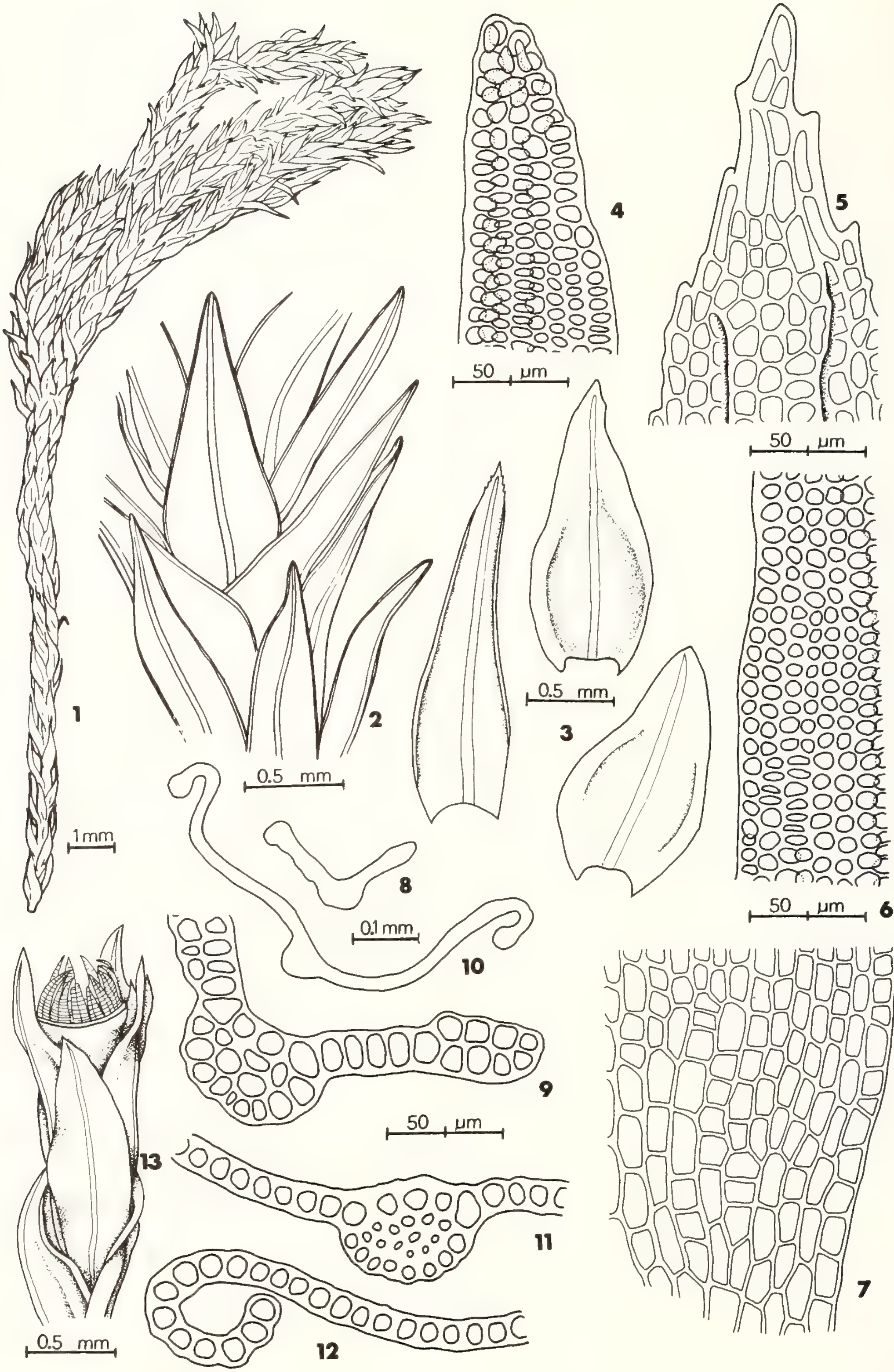
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Plate 130. *Grimmia rivularis*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4–5, apical. 6, median-marginal. 7, alar.). 8–9. Cross-sections of leaves near apex. 10. Cross-section of leaf near base. 11. Cross-section of costa near base. 12. Cross-section of marginal cells near base. 13. Capsule with perichaetial leaves (dry).

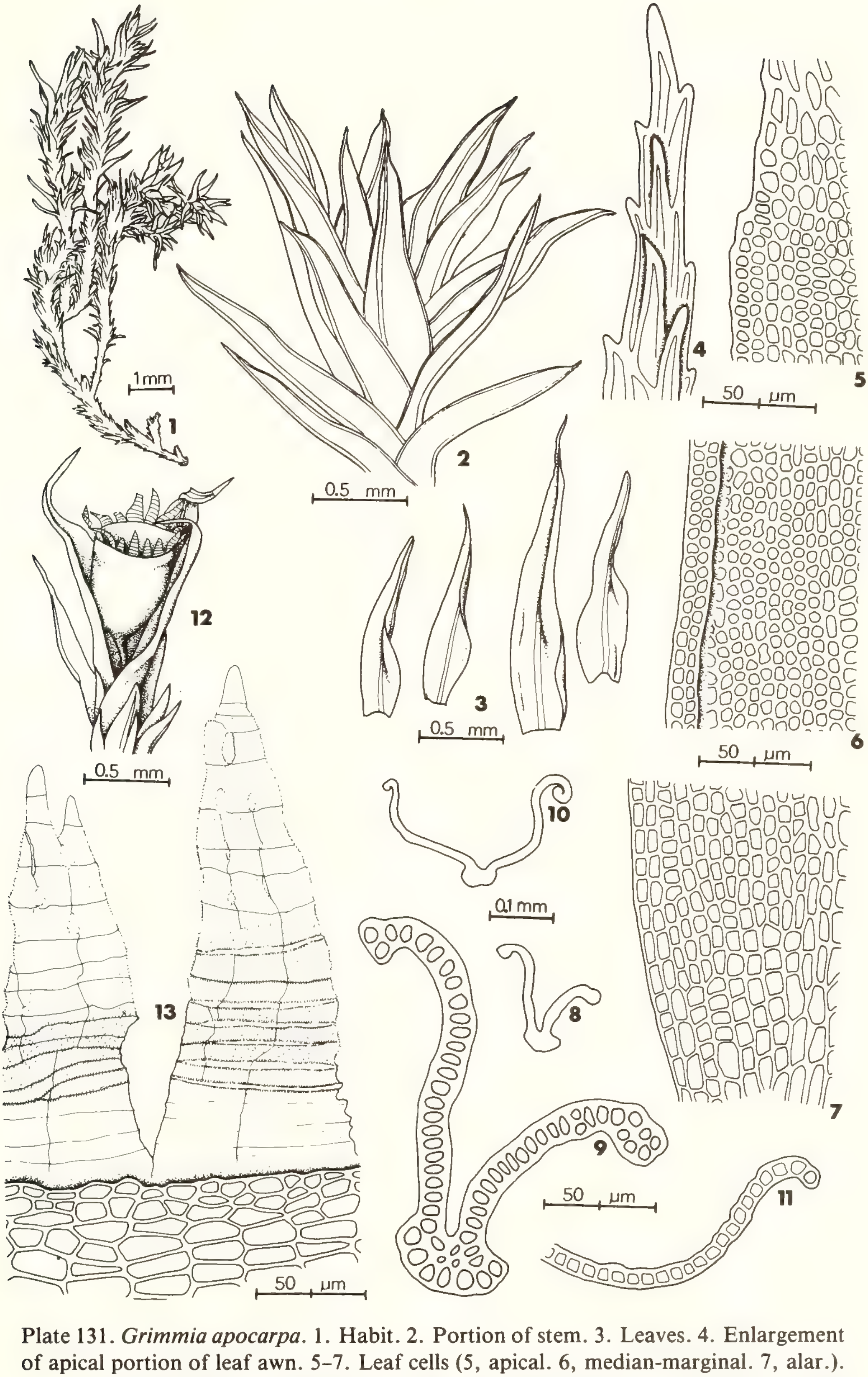
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Plate 131. *Grimmia apocarpa*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Enlargement of apical portion of leaf awn. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8–9. Cross-sections of leaves near apex. 10. Cross-section of leaf near base. 11. Cross-section of marginal cells near base. 12. Capsule with perichaetial leaves (dry). 13. Peristome teeth.

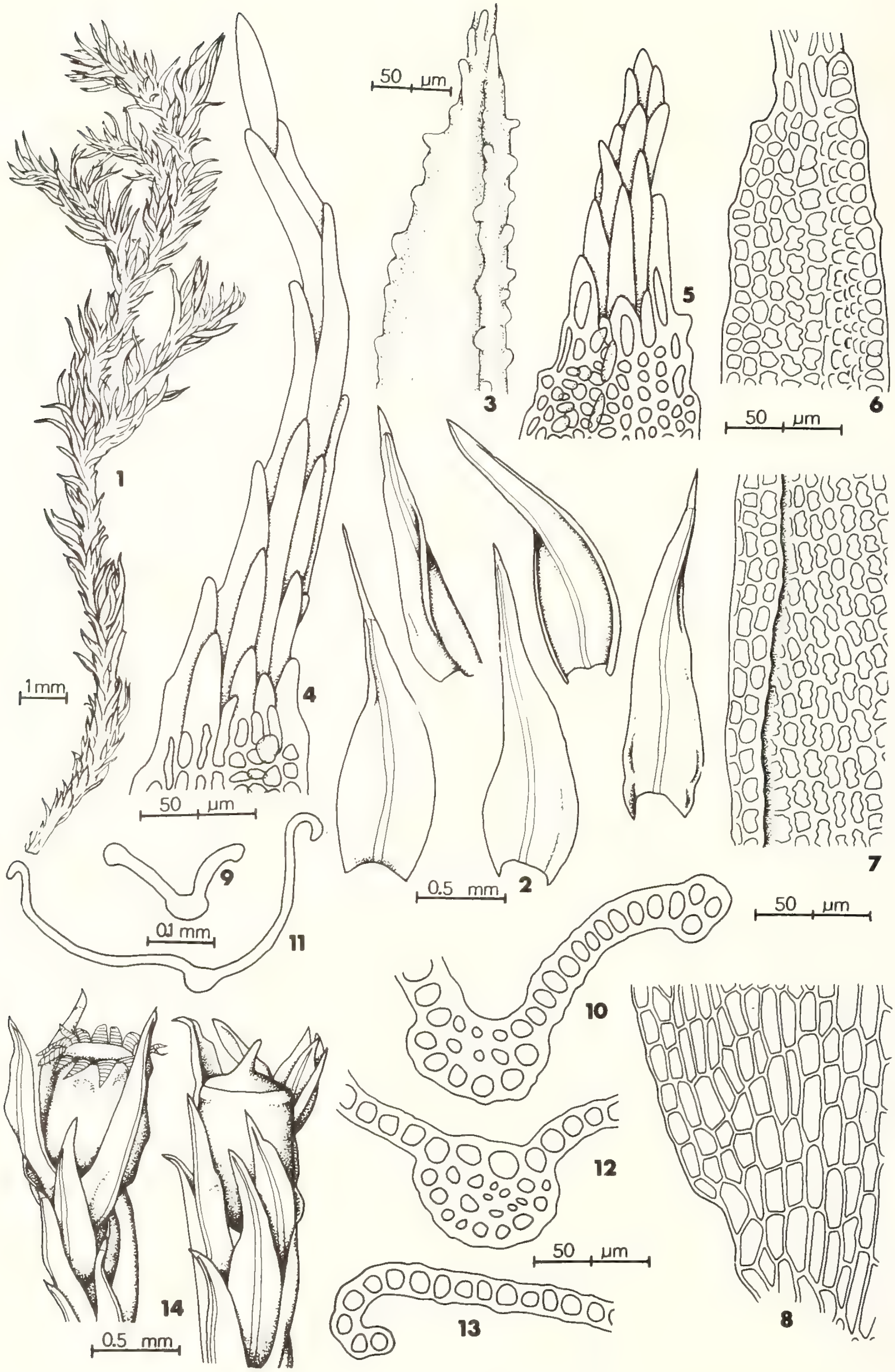
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Plate 132. *Grimmia apocarpa* var. *gracilis*. 1. Habit. 2. Leaves. 3. Costa profile near apex. 4–5. Awn of leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9–10. Cross-sections of leaves near apex. 11. Cross-section of leaf near base. 12. Cross-section of costa near base. 13. Cross-section of marginal cells near base. 14. Capsules with perichaetial leaves (dry).

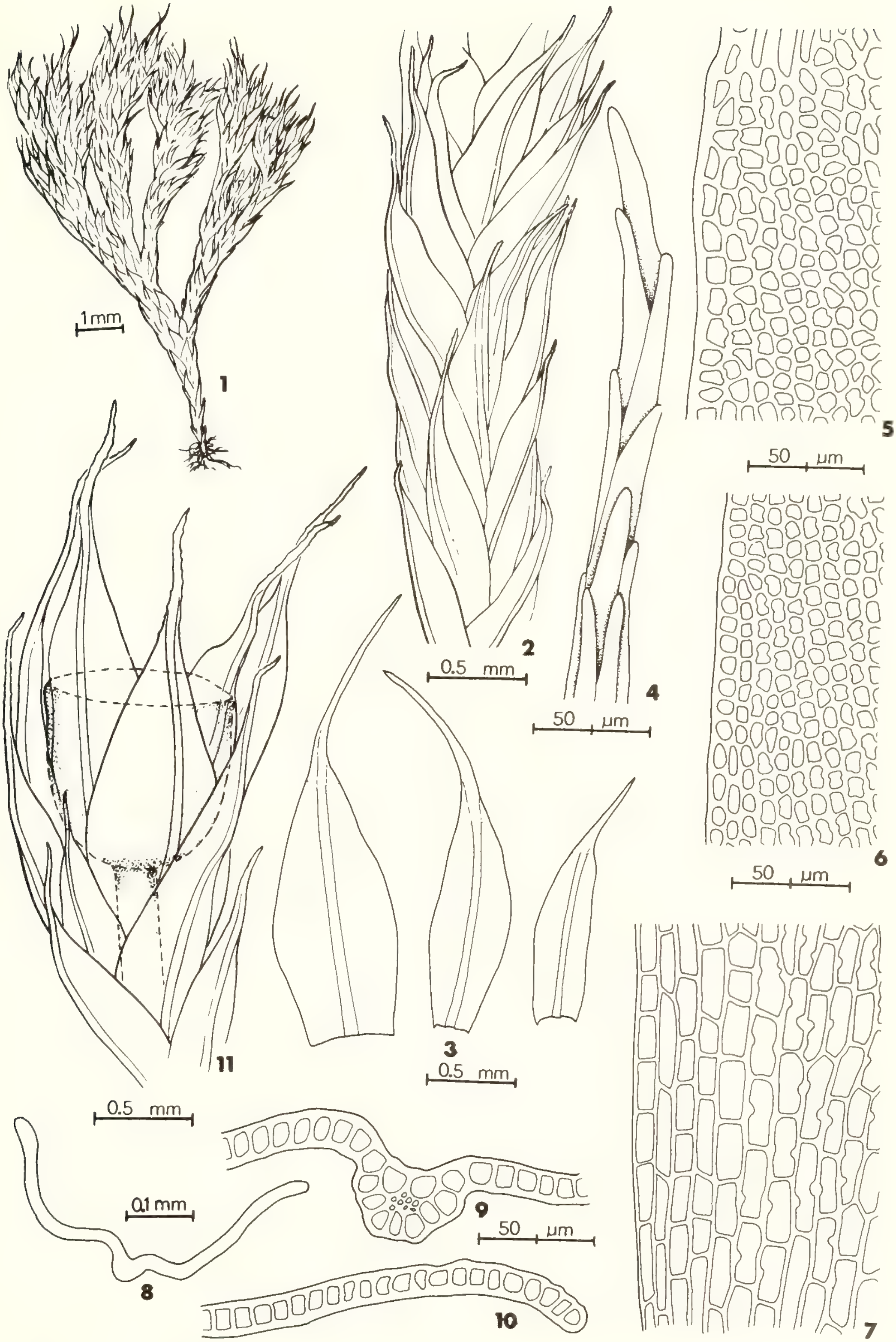
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Plate 133. *Grimmia anodon*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Enlargement of apical portion of leaf awn. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf below middle. 9. Cross-section of costa below middle. 10. Cross-section of marginal cells below middle. 11. Capsule with perichaetial leaves (wet).

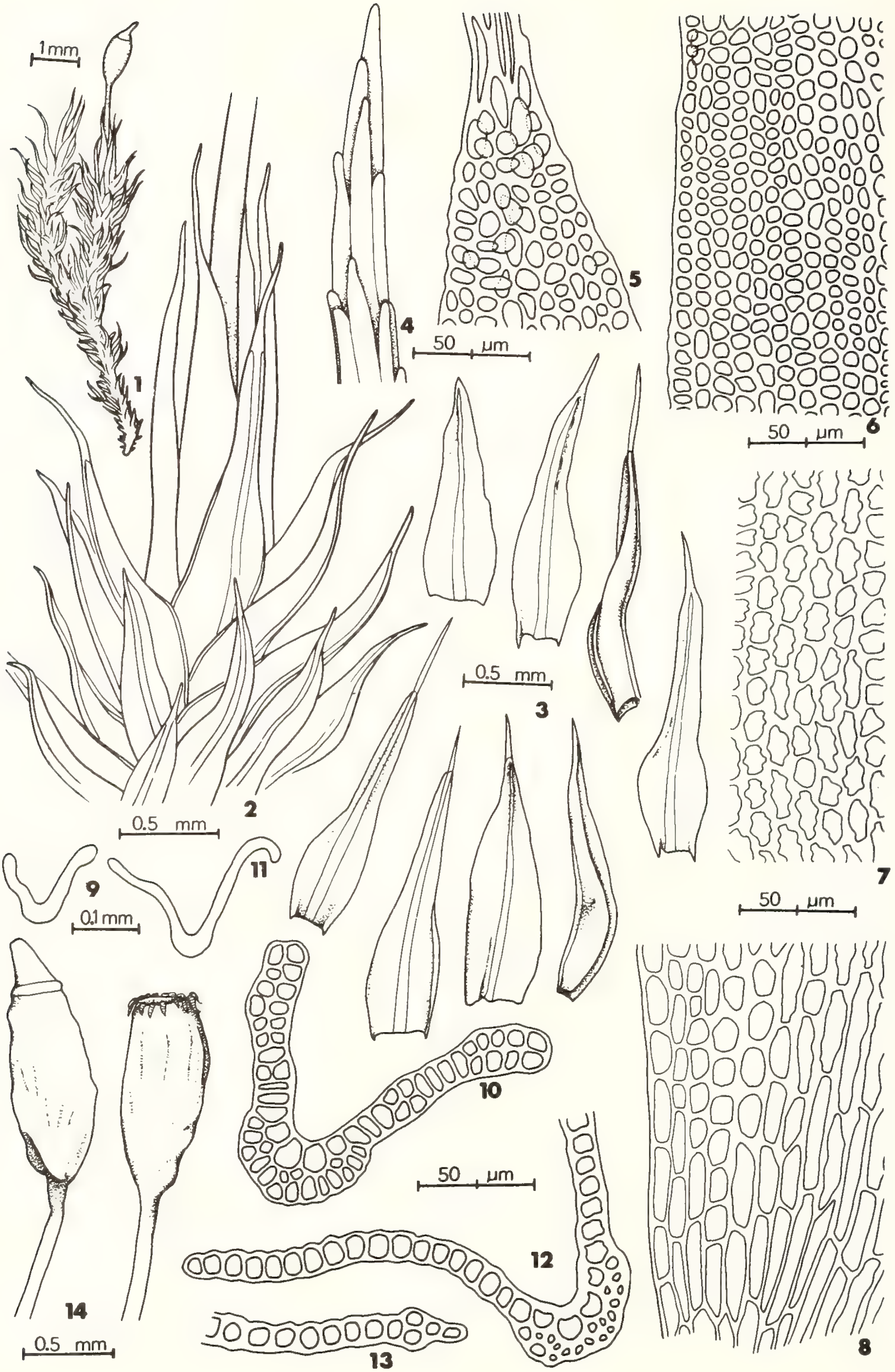
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Plate 134. *Grimmia affinis*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Enlargement of apical portion of leaf awn. 5–8. Leaf cells (5, apical. 6, median-marginal. 7, median (below middle). 8, alar.). 9–10. Cross-sections of leaves near apex. 11–12. Cross-sections of leaves near base. 13. Cross-section of marginal cells near base. 14. Capsules (dry).

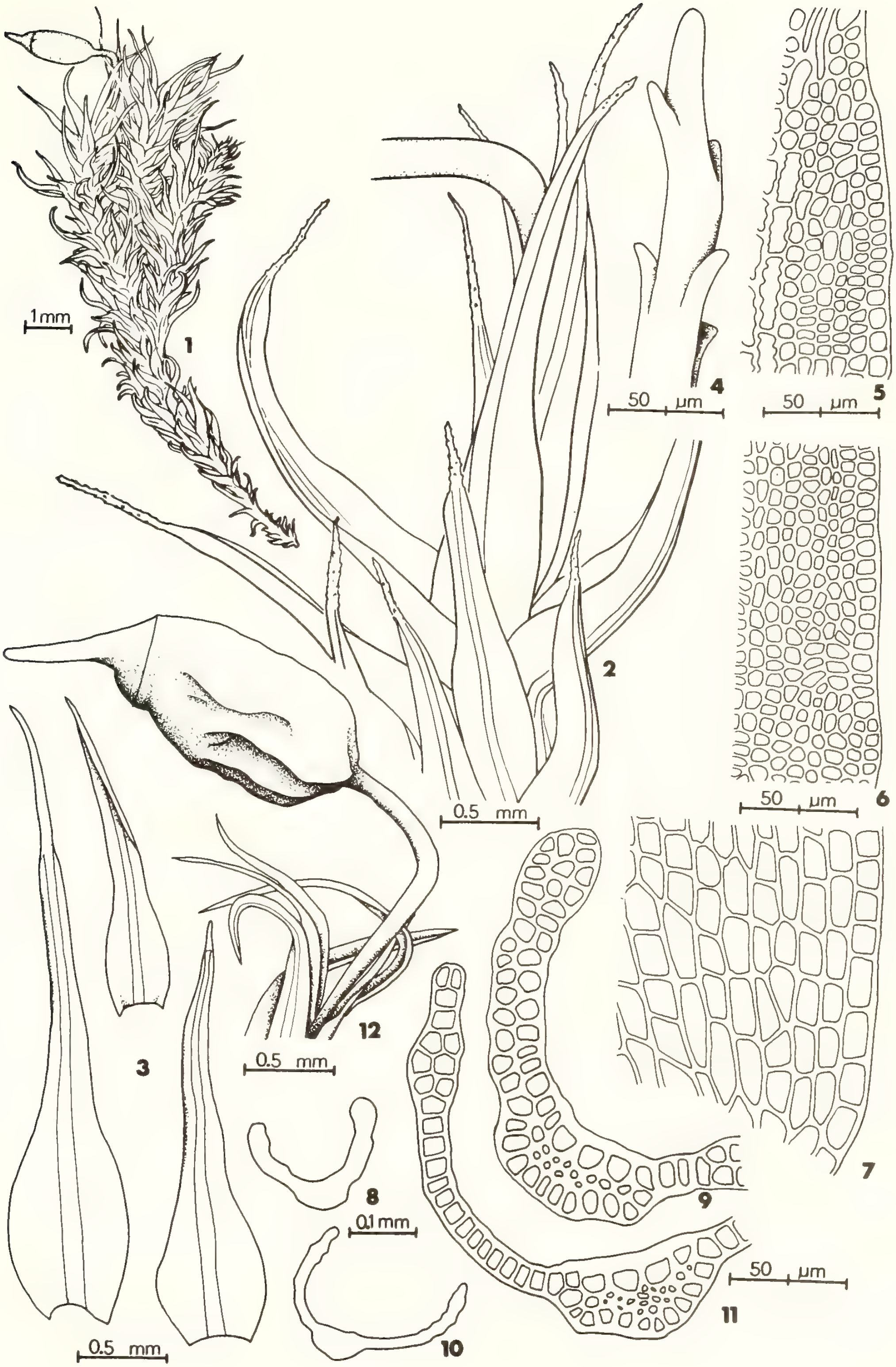
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Plate 135. *Grimmia olneyi*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Enlargement of apical portion of leaf awn. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8–9. Cross-sections of leaves near apex. 10–11. Cross-sections of leaves above middle. 12. Capsule (dry).

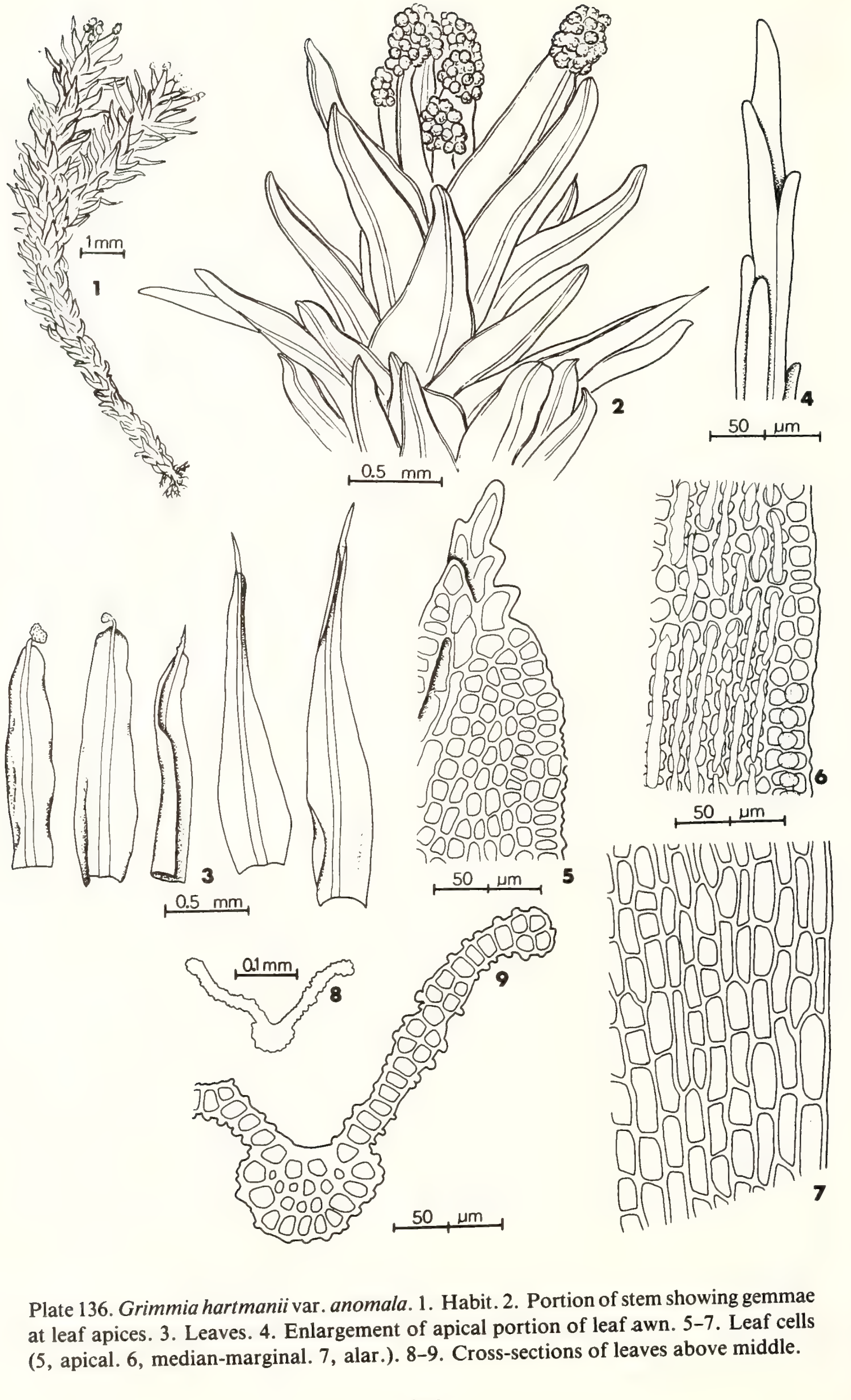
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Plate 136. *Grimmia hartmanii* var. *anomala*. 1. Habit. 2. Portion of stem showing gemmae at leaf apices. 3. Leaves. 4. Enlargement of apical portion of leaf awn. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8–9. Cross-sections of leaves above middle.

2. **Rhacomitrium** Brid., Mant. Musc. 78. 1819.

Habit: In erect or decumbent, loose tufts.

Colour: Light green to yellowish green or dark green to nearly black.

Stems: 2–12 cm long, erect or decumbent, branched with many short, tuft-like branches or sometimes simple, rhizoids at base.

Leaves: Erect, spreading or squarrose, erect and imbricate or sometimes contorted when dry, concave or keeled, unistratose or bistratose above on margins, lanceolate, ovate-lanceolate or lingulate, acute or obtuse, often ending in a serrulate to serrate, hyaline awn of varying length, nondecurrent to shortly decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Recurved on one or both sides, often to near apex, entire to serrate, entire below hyaline awn.

Costae: Single, subpercurrent, often extending into base of awn, smooth or papillose.

Leaf Cells: Smooth or multipapillose, the walls thick, sinuose-nodulose, pitted. Upper cells isodiametric to elongate, median cells elongate, basal cells elongate, alar cells usually differentiated, often inflated, thin-walled and nonsinuose, 10–20 quadrate to short-rectangular cells on margins.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Mitrate, naked, fugacious.

Capsules: Solitary, exserted laterally on a seta near the stem apex, brown, reddish brown or black, ellipsoidal, ovoid or cylindric, straight, erect, sometimes inclined when dry, smooth or wrinkled when dry.

Setae: Elongate, straight or somewhat flexuose when dry, smooth, twisted when dry, brown to black.

Annuli: Present, of 1–4 rows of cells, deciduous.

Opercula: Rostrate, straight.

Peristomes: Single, consisting of 16, red, papillose teeth, divided to the middle or below into 2–3 segments.

Spores: Yellow to greenish or brownish yellow, globose to ovoid, smooth or minutely papillose, 7–19 μm in longest dimension.

Bryologists sometimes omit the "h" and employ the spelling *Racomitrium* which is the original one used by Bridel. However, I have followed the revised spelling recommended by Crundwell (1970).

1. Leaves with a hyaline apex of varying length 2
  2. Cells of hyaline apex smooth or serrulate to toothed 3
    3. Leaf margins often bistratose near apex 4
      4. Stems usually with many, short, lateral branches .... 5a. *R. heterostichum* var. *alopercurum* (in part)
      4. Stems lacking short, lateral branches or rarely a few present ... 6. *R. sudeticum*
    3. Leaf margins unistratose 5
      5. Cells just below hyaline apex mostly isodiametric .... 5. *R. heterostichum*
      5. Cells just below hyaline apex mostly elongate .... 5b. *R. heterostichum* var. *microcarpon*
  2. Cells of hyaline apex multipapillose 6
    6. Margins of hyaline apex erose; plants grayish green .... 3. *R. lanuginosum*
    6. Margins of hyaline apex not erose; plants yellowish green 7
      7. Stems with few, short, lateral branches, irregularly arranged along stem; leaf papillae often over 6 μm in height (measured in cross-section near leaf middle) .... 4. *R. canescens*
      7. Stems with many, short, lateral branches at regular intervals along stem; leaf papillae seldom reaching 6 μm in height .... 4a. *R. canescens* var. *ericoides*
1. Leaves lacking hyaline apex 8
  8. Apical leaf cells elongate; laminae unistratose .... 2. *R. fasciculare*
  8. Apical leaf cells isodiametric or nearly so; laminae unistratose or bistratose 9
    9. Leaf apices broad, crenulate to dentate; laminae unistratose .... 1. *R. aciculare*
    9. Leaf apices narrow, entire or nearly so; laminae bistratose on margins near apex .... 5a. *R. heterostichum* var. *alopecurum* (in part)

1. **Rhacomitrium aciculare** (Hedw.) Brid., Mant. Musc. 80. 1819.
Dicranum aciculare Hedw., Spec Musc. 135. 1801.
[Synonym: *R. neevii* (C. Müll.) Watts]
PLATE 137

Plants erect, dark green to nearly black, stems to 5 cm long; leaves 1.5–3.0 mm long, broadly lanceolate to lingulate, apex obtuse, margins recurved to middle and above, strongly toothed at apex, rarely entire, lamina unistratose, costa ending several cells below apex, leaf cells indistinctly multipapillose, the upper cells isodiametric or nearly so, becoming elongate near leaf middle, alar cells differentiated, quadrate to short-rectangular; capsules ellipsoidal to cylindric, 1.5–3.0 mm long, setae 0.7–1.2 cm long.

Habitat: On sandy soil over rock in or beside streams and lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Saint John, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria, Yarmouth).

Range: Newfoundland and Labrador to Ontario, south to *Georgia and Tennessee; disjunctive to western North America, occurring in Alaska, south to California, Idaho, and *Montana. Europe, *Asia, *Africa.

Chromosome Number: n = 12, 13.

2. **Rhacomitrium fasciculare** (Hedw.) Brid., Mant. Musc. 80. 1819.
Trichostomum fasciculare Hedw., Spec. Musc. 110. 1801.
PLATE 138

Plants decumbent, green to yellowish green, brownish with age, stems to 5 cm long; leaves 2.5–4.0 mm long, lanceolate, often with an ovate base, acute to narrowly obtuse, margins recurved to middle and above, entire, lamina unistratose, costa ending below apex, leaf cells distinctly multipapillose with large papillae on both surfaces, the cells elongate throughout, alar cells differentiated, a few enlarged or inflated, thin-walled, nonsinuose cells along margins; capsules cylindric, 1.5–2.0 mm long, setae 0.5–1.2 cm long.

Habitat: On exposed boulders or dry cliff faces.

Maritime Distribution: Rare. New Brunswick (Charlotte); Nova Scotia (Inverness, Victoria).

Range: Greenland to Alaska, south to New Hampshire, New York, Minnesota, Colorado, and Oregon. *South America, Europe, Asia, *Africa, *New Zealand.

Chromosome Number: n = 12, 13.

3. **Rhacomitrium lanuginosum** (Hedw.) Brid., Mant. Musc. 79. 1819.
Trichostomum lanuginosum Hedw., Spec. Musc. 109. 1801.
PLATE 139

Plants decumbent, yellowish green to brownish green, sometimes grayish green, stems to 12 cm long; leaves 2.0–4.5 mm long, lanceolate to ovate-lanceolate, sometimes falcate-secund, apex ending in a long, hyaline, erose, papillose awn, decurrent down margins, margins recurved to above the middle, entire below awn, lamina unistratose, costa ending in awn, leaf cells distinctly multipapillose with large papillae on walls of hyaline awn cells, other cells minutely mamillose on walls or smooth, awn cells elongate, other upper cells quadrate to short-rectangular, becoming elongate below, alar cells differentiated on margins, quadrate to rectangular, thin-walled, nonsinuose; capsules unknown on Maritime plants, reported to be ovoid to cylindric, 1.4–1.8 mm long, setae 0.3–0.7 cm long.

Habitat: On exposed boulders and cliff shelves.

Maritime Distribution: Rare. Nova Scotia (Cape Breton, Halifax, Inverness, Victoria).

Range: Greenland to Alaska, south to New Hampshire, New York, Montana, Idaho, and California. South America, Europe, Asia, New Zealand, Pacific Islands.

Chromosome Number: n = 12, 13, 14.

Remarks: Commonly called the "Woolly Fringe Moss" because of the white, erose leaf margins. Capsules drawn from British Columbia plants.

4. **Rhacomitrium canescens** (Hedw.) Brid., Mant. Musc. 78. 1819.
Trichostomum canescens Hedw., Spec. Musc. 111. 1801.
PLATE 140

Plants decumbent, light green to yellowish green, stems to 7 cm long; leaves 1.5–3.0 mm long, ovate-lanceolate, apex ending in a short to long, hyaline, serrate to serrulate, papillose awn, margins recurved to near awn, entire, lamina unistratose, costa ending in awn, sometimes somewhat below, leaf cells distinctly multipapillose with large papillae on both surfaces of lumens, the upper cells isodiametric to elongate, becoming elongate near leaf middle, alar cells differentiated, inflated, thin-walled, nonsinuose along margins; capsules ovoid to cylindric, 1.5–2.0 mm long, setae 1–2 cm long.

Habitat: On soil over rock or on gravelly roadside banks, frequently in exposed situations.

Maritime Distribution: Rare or seldom collected. New Brunswick (Restigouche, York); Nova Scotia (Inverness, Victoria).

Range: Greenland to Alaska, south to New Hampshire, New York, Michigan, Colorado, Idaho, and California. Europe, Asia, *Africa, Australia, Pacific Islands.

Chromosome Number: n = 12, 13, 14.

4a. Rhacomitrium canescens var. **ericoides** (Brid.) Hampe, Flora 20: 281. 1837.
Rhacomitrium ericoides Brid., Musc. Rec. Suppl. 4: 78. 1819.
[Synonym: *R. canescens* f. *ericoides* (Brid.) Mönk.]
PLATE 141

Similar to var. *canescens* but differing in the numerous, short, lateral branches at regular intervals along the stem and in the shorter papillae on the leaf cells, seldom reaching 6 μm in height.

Habitat: Similar to that of var. *canescens*.

Maritime Distribution: Rare or seldom collected. New Brunswick (Restigouche, York); Nova Scotia (Inverness, Victoria).

Range: The same as var. *canescens* but apparently more common in western North America. Europe, Asia, *Africa.

Chromosome Number: n = 12.

5. Rhacomitrium heterostichum (Hedw.) Brid., Mant. Musc. 79. 1819.
Trichostomum heterostichum Hedw., Spec. Musc. 109. 1801.
[Synonym: *R. heterostichum* var. *gracilescens* B.S.G.]
PLATE 142

Plants erect to decumbent, dark green to yellowish green, reddish brown to black below, stems to 5 cm long; leaves 2–3 mm long, lanceolate to ovate-lanceolate, apex ending in a short to long, hyaline, serrulate to toothed awn, margins recurved to near awn, entire, lamina unistratose, costa ending in base of awn, leaf cells smooth, the upper cells quadrate to short-rectangular, becoming elongate near leaf middle, alar cells differentiated on margins, sometimes with 10–20 quadrate or short rectangular, thin-walled, nonsinuose cells; capsules cylindric, 1.5–2.5 mm long, setae 0.3–0.7 cm long.

Habitat: On sandy soil on boulders and cliffs, often beside streams and lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, York); Nova Scotia (Digby, Halifax, Lunenburg, Shelburne, Victoria).

Range: Labrador and Newfoundland to Alaska, south to North Carolina, Michigan, Minnesota, Colorado, Idaho, and California. *South America, Europe, Asia, *Africa, *Australia, New Zealand.

Chromosome Number: n = 13, 14.

5a. Rhacomitrium heterostichum var. **alopecurum** Hüb., Musc. Germ. 208. 1833.
[Synonym: *R. heterostichum* var. *affine* (Web. & Mohr) Lesq.]
PLATE 143

Differing from the var. *heterostichum* in the leaves that are usually obtuse and bistratose on the margins. A few lower leaves sometimes have a short hyaline point.

Habitat: Similar to that of var. *heterostichum* except one collection was made on the base of a tree.

Maritime Distribution: Common. New Brunswick (Albert, Queen's, Saint John); Nova Scotia (Annapolis, Digby, Halifax, Hants, Kings, Shelburne, Victoria, Yarmouth).

Range: Probably with the same distribution as var. *heterostichum* but more common in eastern North America than the western part. Europe.

Chromosome Number: Unreported.

5b. Rhacomitrium heterostichum var. **microcarpon** (Hedw.) Boul., Muscin. France 1: 360. 1884.
Trichostomum microcarpum Hedw., Spec. Musc. 112. 1801.
[Synonyms: *R. microcarpum* (Hedw.) Brid.; *R. heterostichum* var. *ramulosum* (Lindb.) Corb.]
PLATE 143

Differing from the var. *heterostichum* only in the upper leaf cells which are nearly all elongate.

Habitat: On dry, exposed boulders and cliff shelves.

Maritime Distribution: Rare or seldom collected. New Brunswick (Restigouche); Nova Scotia (Annapolis, Inverness, Kings, Victoria).

Range: Probably with the same distribution as the var. *heterostichum*. Europe, *Asia.

Chromosome Number: n = 14.

6. Rhacomitrium sudeticum (Funck) B.S.G., Bryol. Eur. 3: 141. 264. 1845 (fasc. 25–28 Mon. 7.1).
Trichostomum sudeticum Funck, Deutschl. Moose 26. 18. 1820.
[Synonym: *R. heterostichum* var. *sudeticum* (Funck) Dix. *ex* Bauer]
PLATE 144

Plants erect to decumbent, dark green to black, sometimes yellowish green, stems to 3 cm long;

leaves 1.5–3.0 mm long, lanceolate to ovate-lanceolate, apex ending in a short, hyaline, serrulate to toothed awn, sometimes awn lacking, margins recurved nearly to apex, entire, lamina unistratose below, bistratose above on margins, costa ending near apex, leaf cells smooth, the upper cells quadrate to short-rectangular, becoming elongate near leaf middle, alar cells differentiated on margins, with 10–15 quadrate to short-rectangular, thin-walled, nonsinuose cells; capsules ovoid to cylindric, 1.5–2.0 mm long, setae 0.3–0.5 cm long.

Habitat: On boulders and cliff shelves, often near water.

Maritime Distribution: Rare. Nova Scotia (Colchester, Halifax, Inverness, Kings, Victoria).

Range: Greenland to Alaska, south to Virginia, Wyoming, Idaho, and Oregon. Europe, Asia.

Chromosome Number: Unreported.

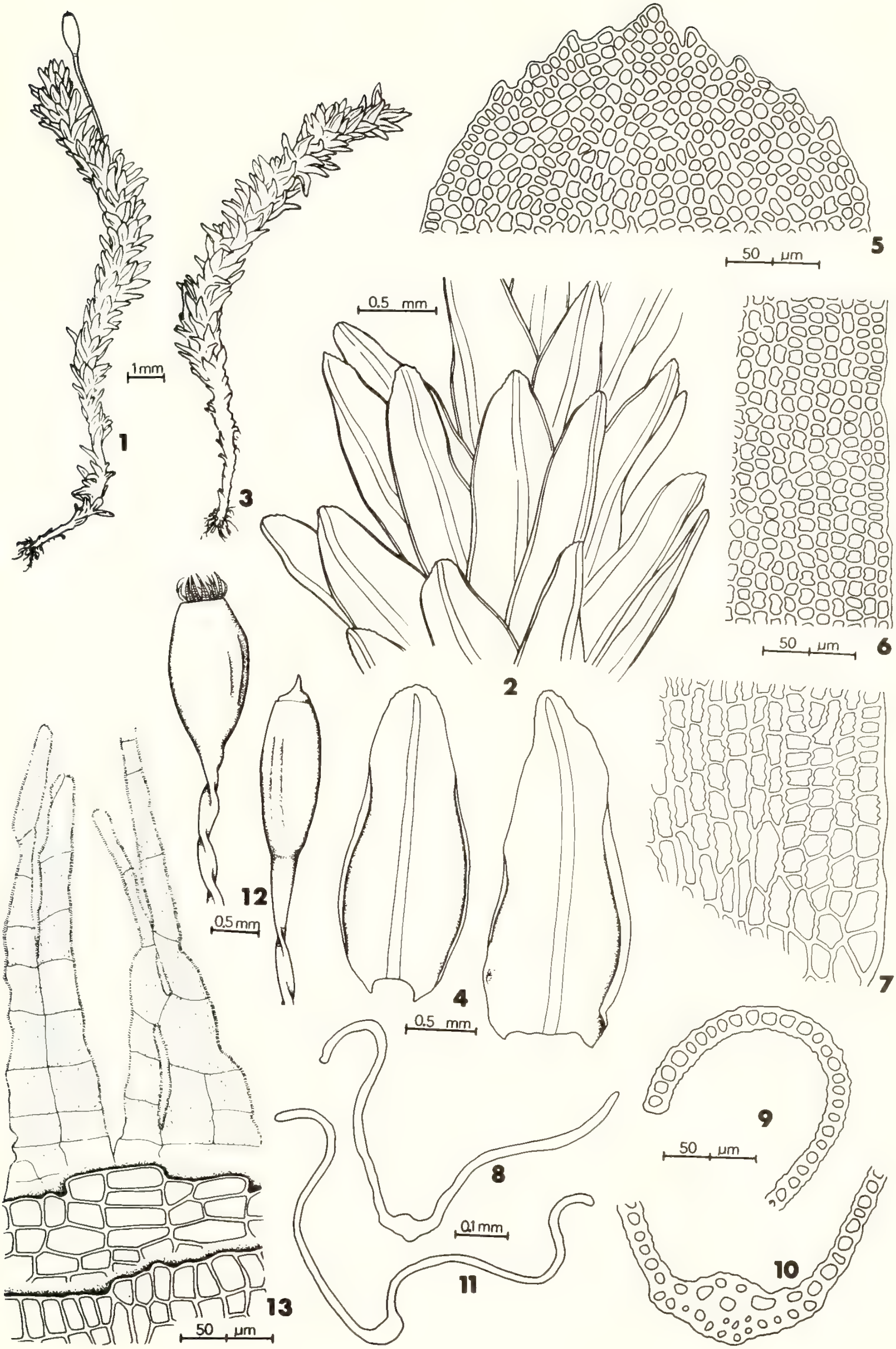
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Plate 137. *Rhacomitrium aciculare*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9. Cross-section of marginal cells above middle. 10. Cross-section of costa above middle. 11. Cross-section of leaf below middle. 12. Capsules (dry). 13. Peristome teeth.

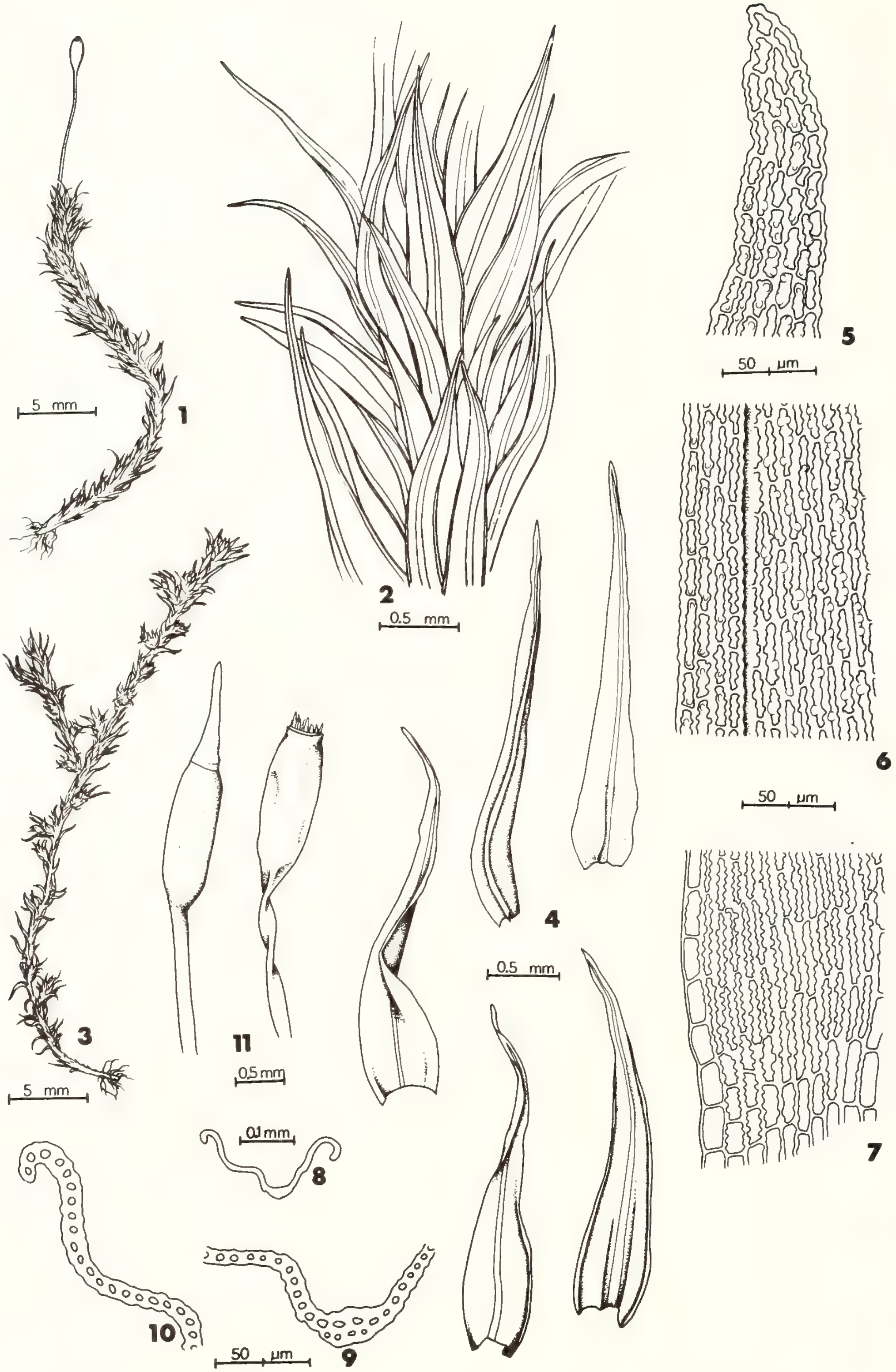
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Plate 138. *Rhacomitrium fasciculare*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9. Cross-section of costa above middle. 10. Cross-section of marginal cells above middle. 11. Capsules (dry).

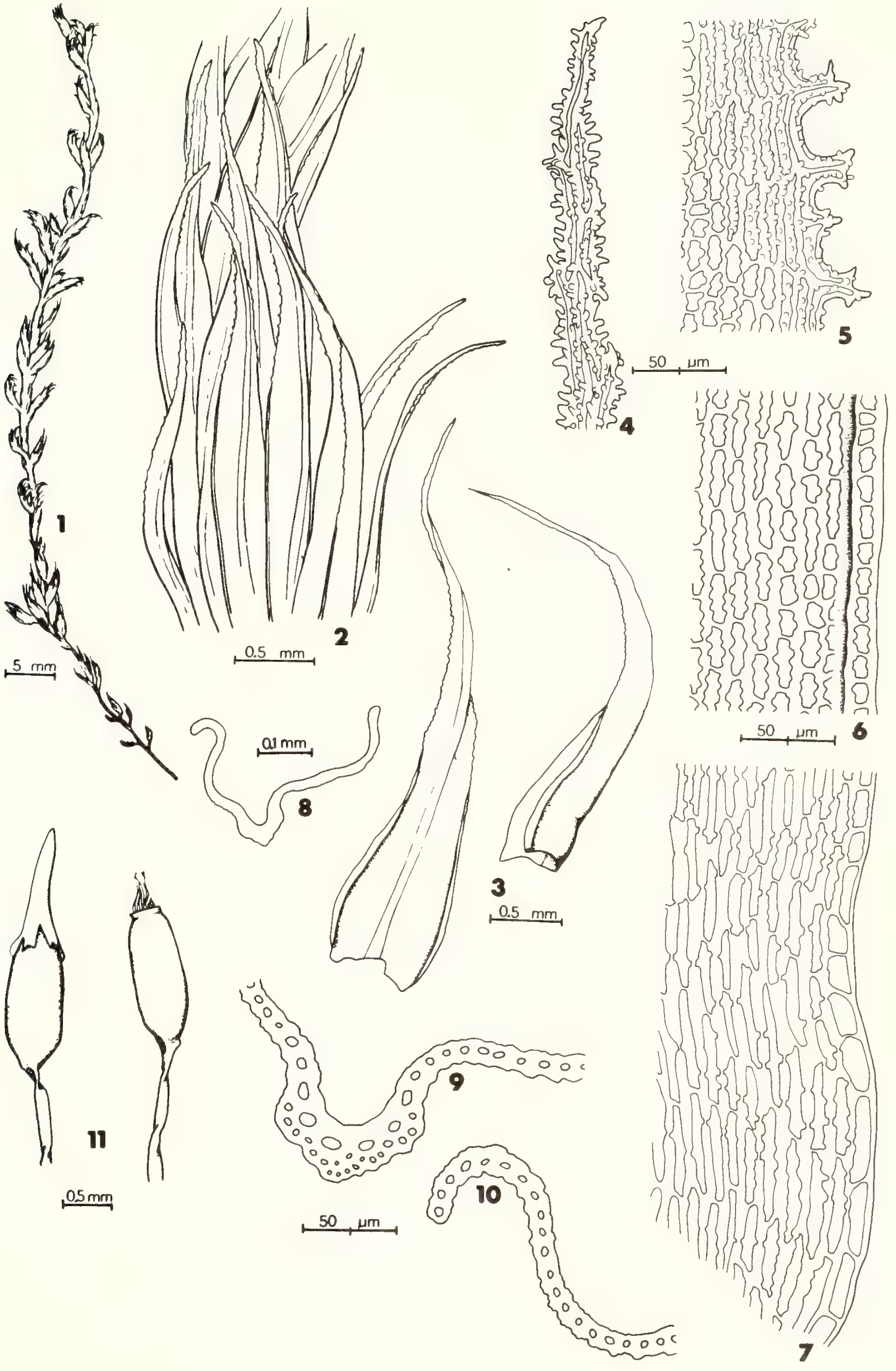
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Plate 139. *Rhacomitrium lanuginosum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Enlargement of apical portion of leaf awn. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf below middle. 9. Cross-section of costa below middle. 10. Cross-section of marginal cells below middle. 11. Capsules (dry).

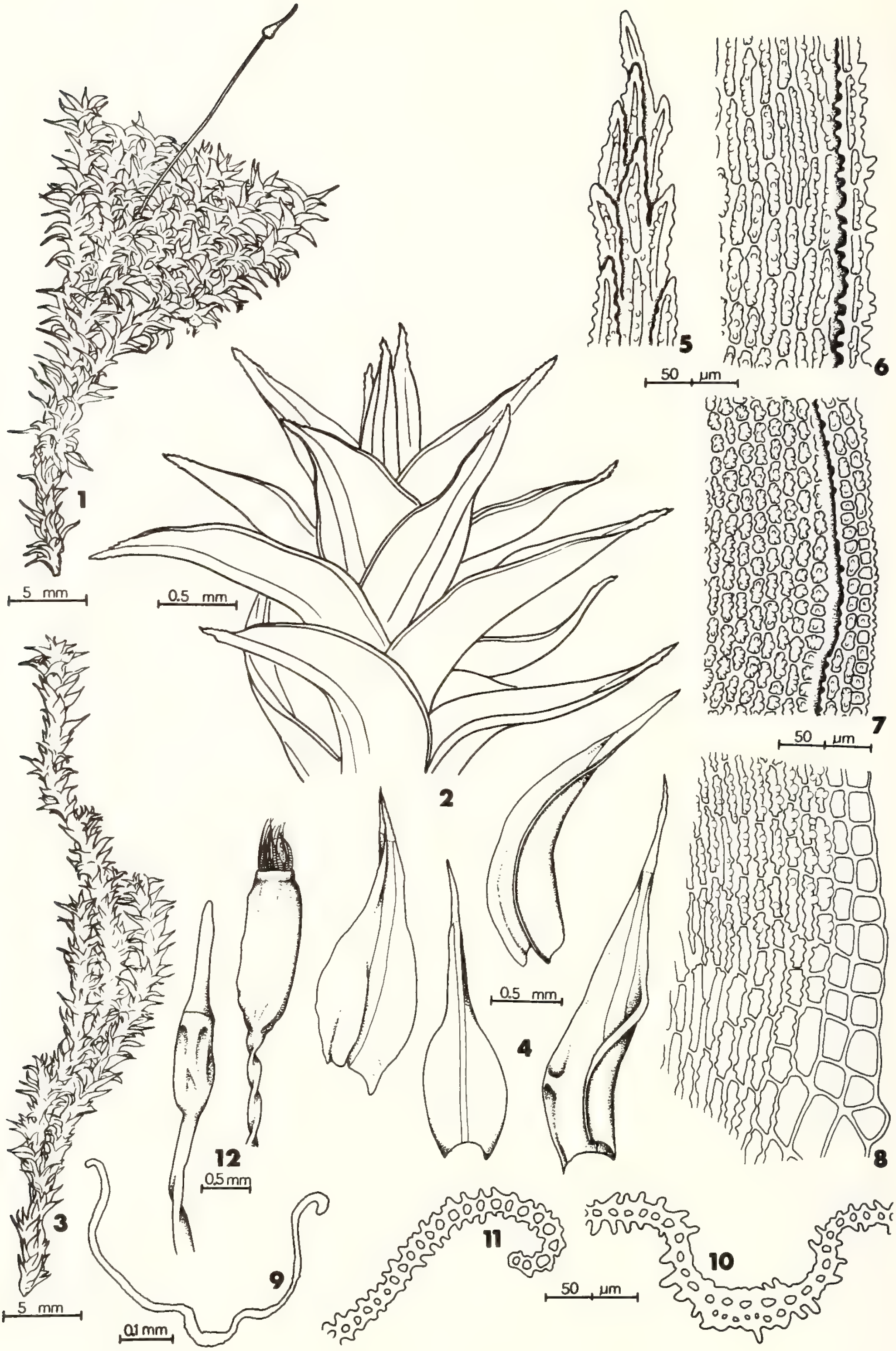
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Plate 140. *Rhacomitrium canescens*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Enlargement of apical portion of leaf awn. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf below middle. 10. Cross-section of costa below middle. 11. Cross-section of marginal cells below middle. 12. Capsules (dry).

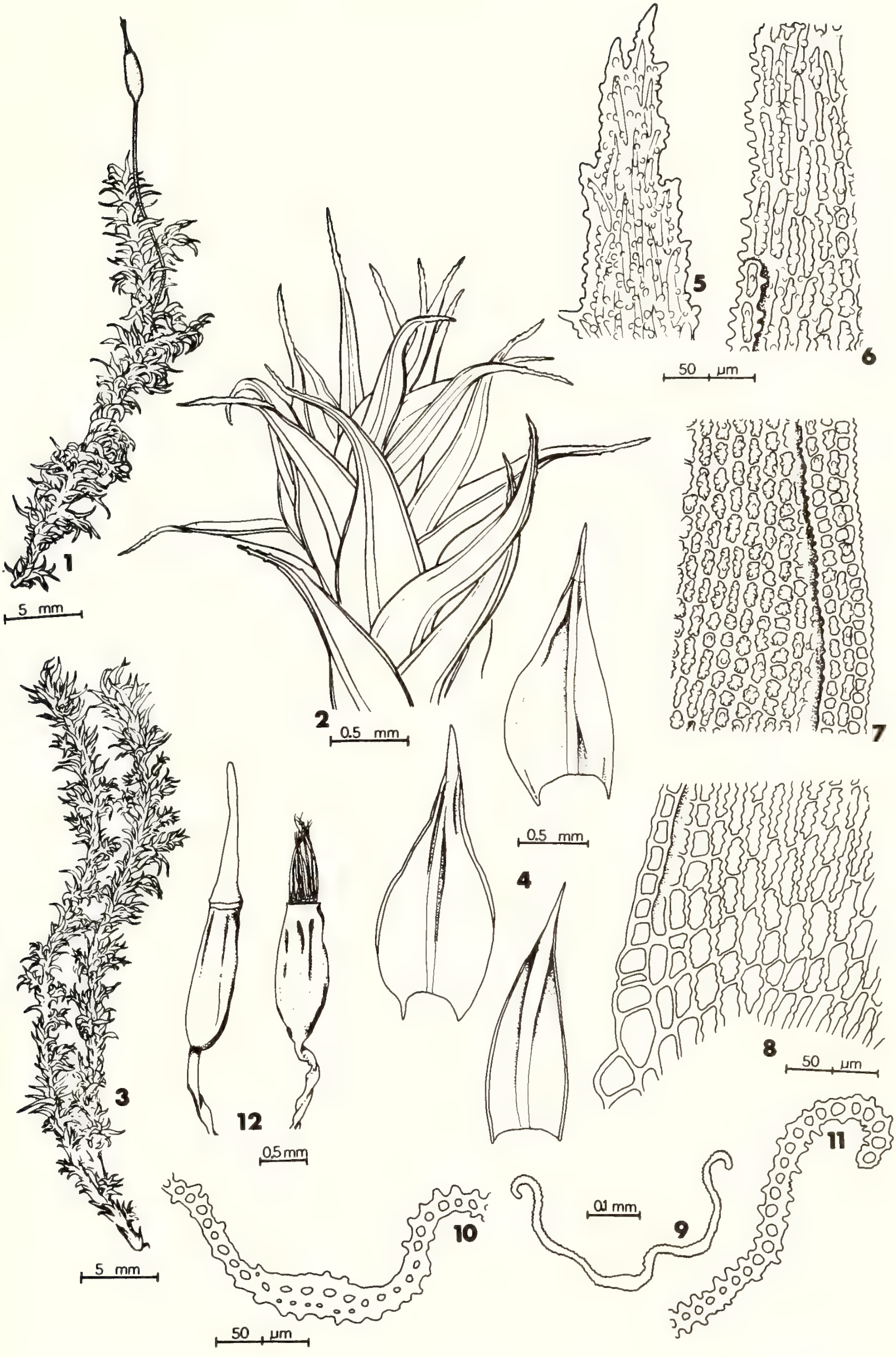
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Plate 141. *Rhacomitrium canescens* var. *ericoides*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Enlargement of apical portion of leaf awn. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf below middle. 10. Cross-section of costa below middle. 11. Cross-section of marginal cells below middle. 12. Capsules (dry).

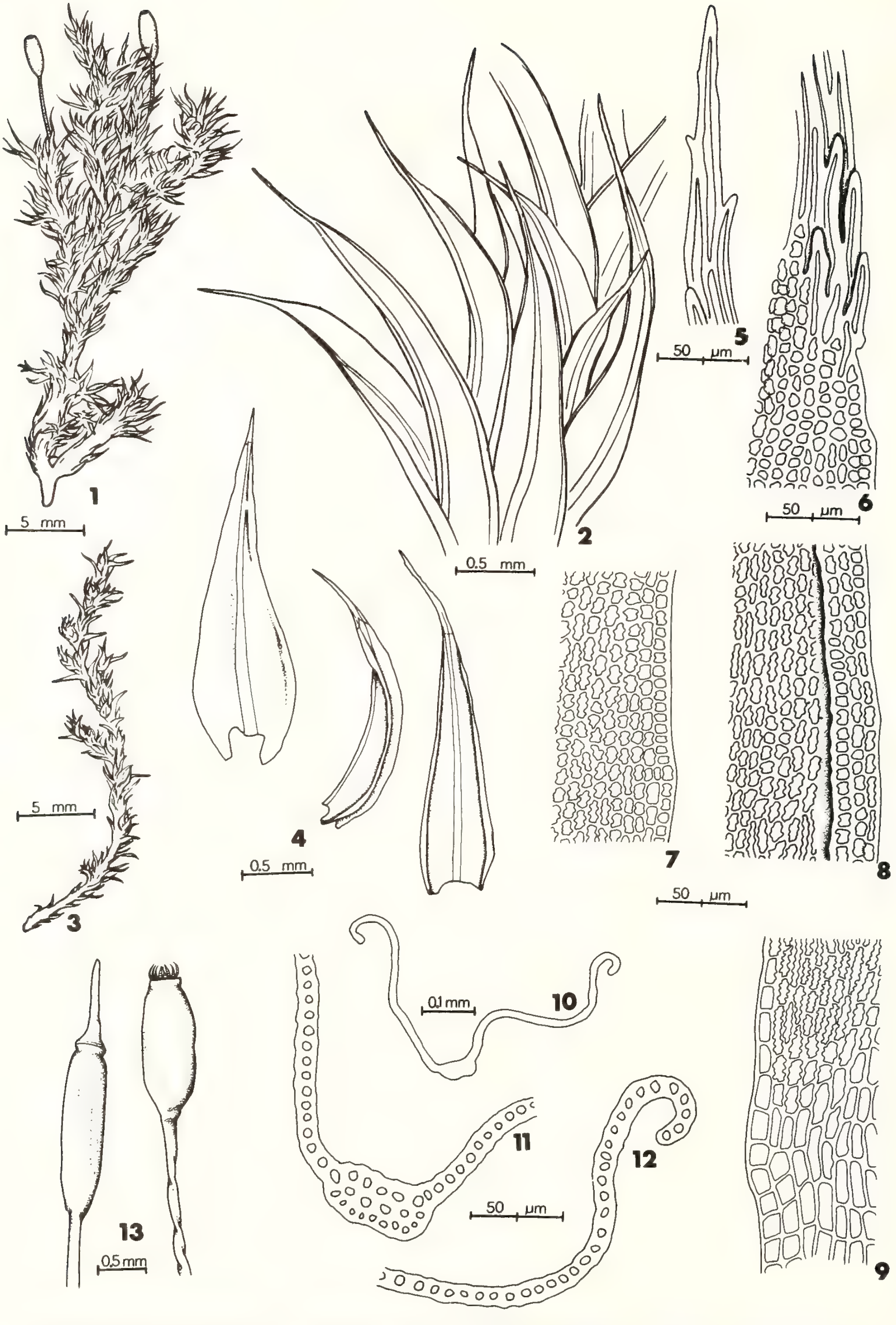
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Plate 142. *Rhacomitrium heterostichum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Enlargement of apical portion of leaf awn. 6–9. Leaf cells (6, apical at base of awn. 7, apical. 8, median-marginal. 9, alar.). 10. Cross-section of leaf below middle. 11. Cross-section of costa below middle. 12. Cross-section of marginal cells below middle. 13. Capsules (dry).

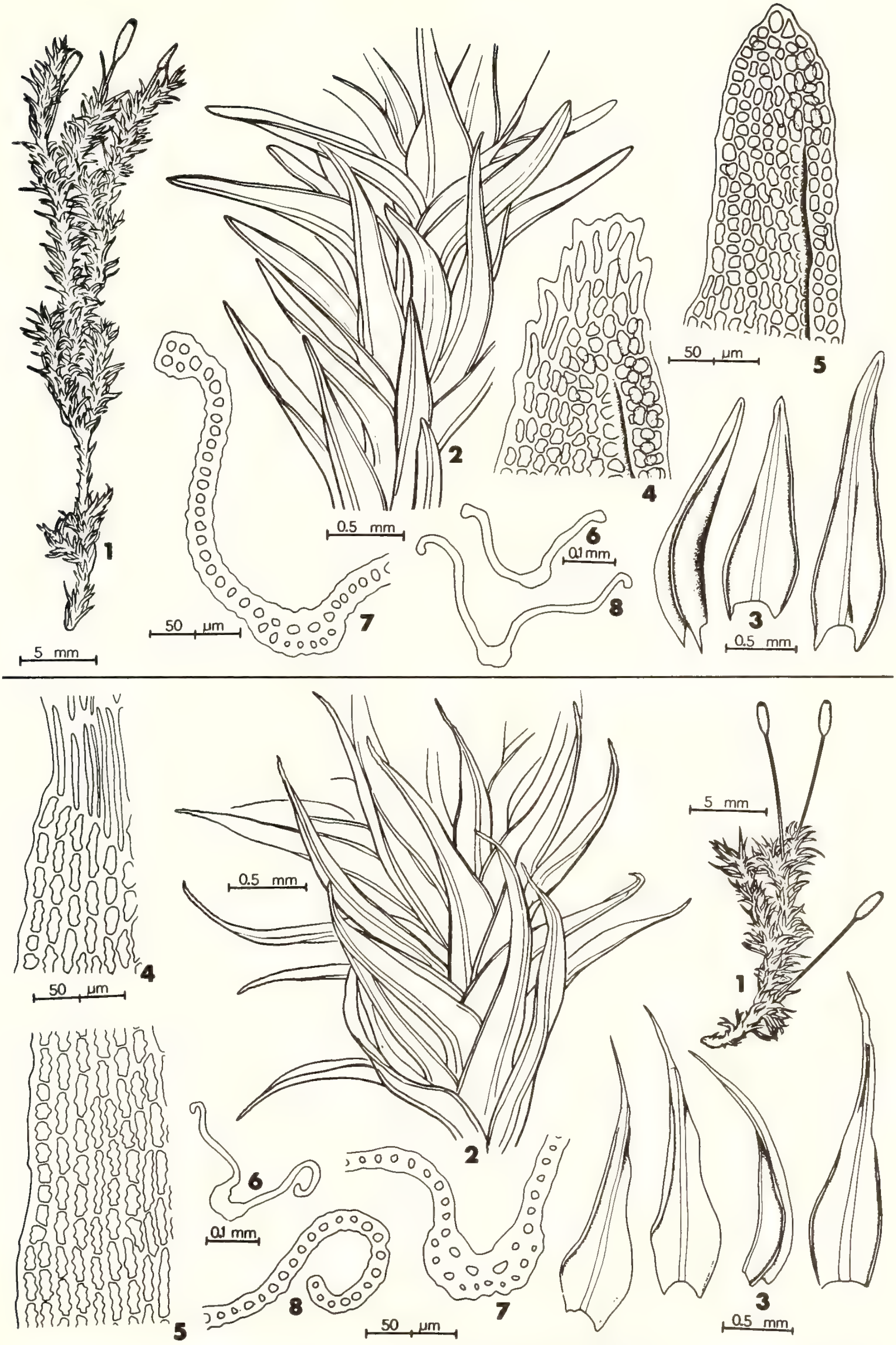
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Plate 143. *Rhacomitrium heterostichum* var. *alopecurum* (above). 1. Habit. 2. Portion of stem. 3. Leaves. 4–5. Apical cells of leaves. 6–7. Cross-sections of leaves above middle. 8. Cross-section of leaf below middle. *Rhacomitrium heterostichum* var. *microcarpon* (below). 1. Habit. 2. Portion of stem. 3. Leaves. 4. Apical cells of leaf at base of awn. 5. Apical cells of leaf. 6. Cross-section of leaf below middle. 7. Cross-section of costa below middle. 8. Cross-section of marginal cells below middle.

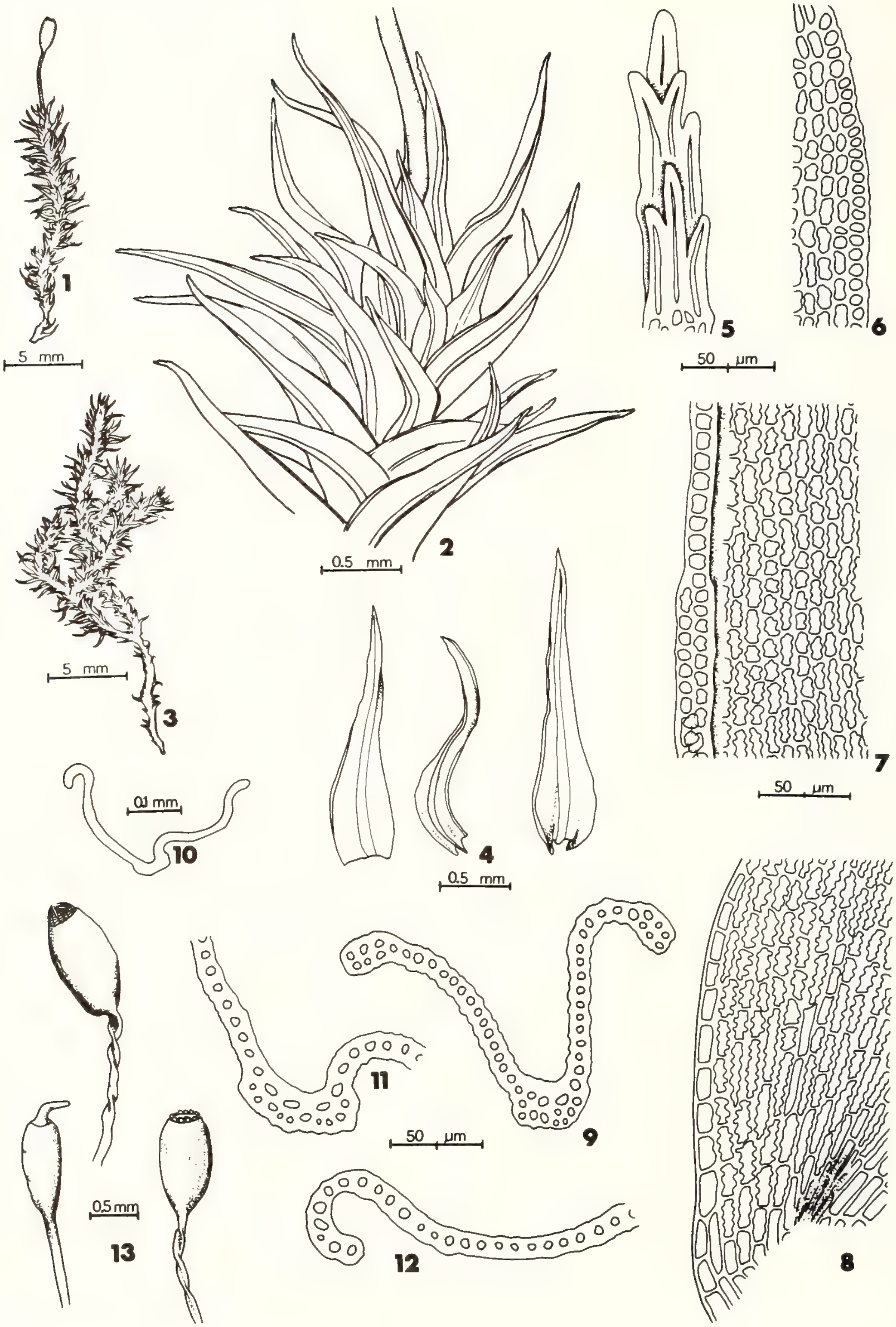
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Plate 144. *Rhacomitrium sudeticum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Awn of leaf. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near apex. 10. Cross-section of leaf near middle. 11. Cross-section of costa near middle. 12. Cross-section of marginal cells near middle. 13. Capsules (dry).

Family FUNARIACEAE

1. Capsules erect, symmetric; peristome lacking .... 1. *Physcomitrium* (p. 269)
1. Capsules inclined to pendulous; peristome present .... 2. *Funaria* (p. 274)

1. **Physcomitrium** (Brid.) Fürnr., Flora 13: 9, 59. 1829.

Gymnostomum subg. *Physcomitrium* Brid., Bryol. Univ. 1: 97. 1826.

Habit: Erect, scattered or sometimes gregarious and in loose tufts.
Colour: Light green or yellowish green.
Stems: 0.2–1.0 cm high, erect, simple or sometimes forked, rhizoids at base.
Leaves: Erect to erect-spreading, contorted when dry, concave, unistratose, oblong-lanceolate to obovate, acute to shortly acuminate, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane, serrulate in upper half.
Costae: Single, ending near apex to shortly excurrent, somewhat prominent on dorsal surface.
Leaf Cells: Smooth, thin-walled, lacking pits. Median cells rectangular to hexagonal, becoming shorter near apex and longer near base.
Asexual Reproductive Bodies: Lacking. A.J. Fife (personal communication) reports that tubers occur in *P. collenchymatum*.
Sex: Autoicous. Perichaetia at stem apices, with few, small, filiform paraphyses; perigonia at apices of short, basal or lateral branches, with short, usually clavate paraphyses.
Calyptrae: Mitrate, long-rostrate, naked, yellowish with a reddish beaked tip.
Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, ovoid, globose or pyriform, erect, often urceolate when dry due to constriction below flaring mouth and at short neck. Stomata usually present, confined to neck, consisting of a single, rounded guard cell with a central slit.
Setae: Long or short, straight or somewhat flexuose, smooth, brown to reddish brown.
Annuli: 1–2 rows of narrow, persistent cells.
Opercula: Convex or apiculate.
Peristomes: Lacking.
Spores: Yellowish, globose to ovoid, papillose to spinose-papillose, 24–47 μm in longest dimension.

1. Setae short, capsules immersed in perichaetial leaves .... 1. *P. immersum*
1. Setae long, capsules exserted above perichaetial leaves 2
    2. Empty capsules shallow, often with a wide, flared mouth; exothecial cells sometimes collenchymatous; spores less than 40 μm in longest dimension ..... 2. *P. collenchymatum*
    2. Empty capsules turbinate, not shallow or with a flared mouth; exothecial cells not collenchymatous; spores often more than 40 μm in longest dimension .... 3. *P. pyriforme*

1. Physcomitrium immersum Sull., Man. Bot. No. U.S. 648. 1848.
PLATE 145

Recognized by its small size (stems 2–4 mm high) and immersed capsules.

Habitat: On bare, exposed soil, often in disturbed habitats, in fall.
Maritime Distribution: Rare or seldom collected. New Brunswick (York); Nova Scotia (Kings).
Range: British Columbia, Ontario, Quebec, New Brunswick, Nova Scotia, Pennsylvania, Wisconsin, Minnesota, and Oregon. *South America.
Chromosome Number: n = 54.

2. Physcomitrium collenchymatum Gier, Trans. Kansas Acad. Sci. 58: 330. 1955.

PLATE 146

Recognized by its small size (stems 2–4 mm high) and hemispheric capsules. Unlike the other Maritime species, the dry, empty capsules of this plant become shallow and very wide-mouthed. The collenchymatous thickenings of the exothecial cells, from which the plant derives its name, are not always evident on the Maritime plants.

Habitat: On moist, shaded soil in rock (calcareous?) crevices and alder thickets, in fall.

Maritime Distribution: Rare or seldom collected. Nova Scotia (Digby). Known from two collections made by W.B. Schofield in 1951; one from northern Long Island (*8700*) and the other from Brier Island, near Westport.

Range: Endemic to North America, occurring in Nova Scotia, Tennessee, Florida, Louisiana, Kansas, and Missouri.

Chromosome Number: Unreported.

Remarks: Crum and Anderson (1964) present an interesting discussion on the distribution and taxonomy of this North American endemic.

3. Physcomitrium pyriforme (Hedw.) Hampe, Linnaea 11: 80. 1837.

Gymnostomum pyriforme Hedw., Spec. Musc. 38. 1801.

[Synonym: *P. turbinatum* (Michx.) Britt.]

PLATE 147

This species, which is the largest of the Maritime Physcomitria, has stems that are 3–10 mm high and large turbinate capsules, 1–2 mm long, that are urceolate when dry.

Habitat: On bare, exposed soil, often in disturbed habitats, in spring.

Maritime Distribution: Probably frequent but seldom collected. New Brunswick (York); Nova Scotia (Annapolis, Colchester, Halifax, Hants, Kings).

Range: Nova Scotia to Alberta, south to Florida, Mississippi, Louisiana, Texas, Colorado, and California. Europe, *Asia, *Africa, *Australia.

Chromosome Number: $n = 9, 26, 27, 36, 52, 54$.

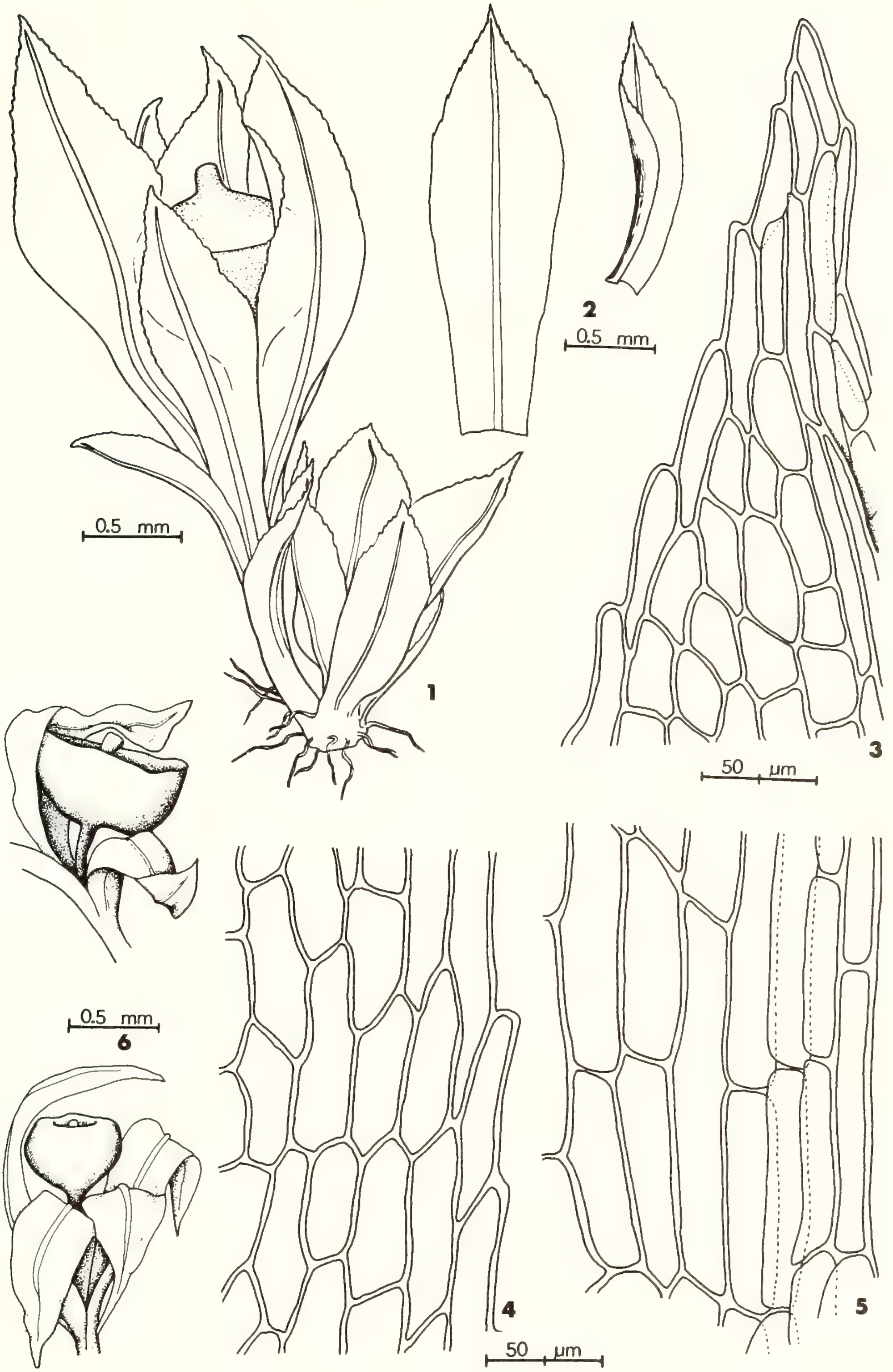
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Plate 145. *Physcomitrium immersum*. 1. Habit. 2. Leaves. 3–5. Leaf cells (3, apical. 4, median-marginal. 5, alar.). 6. Capsules with perichaetial leaves (dry).

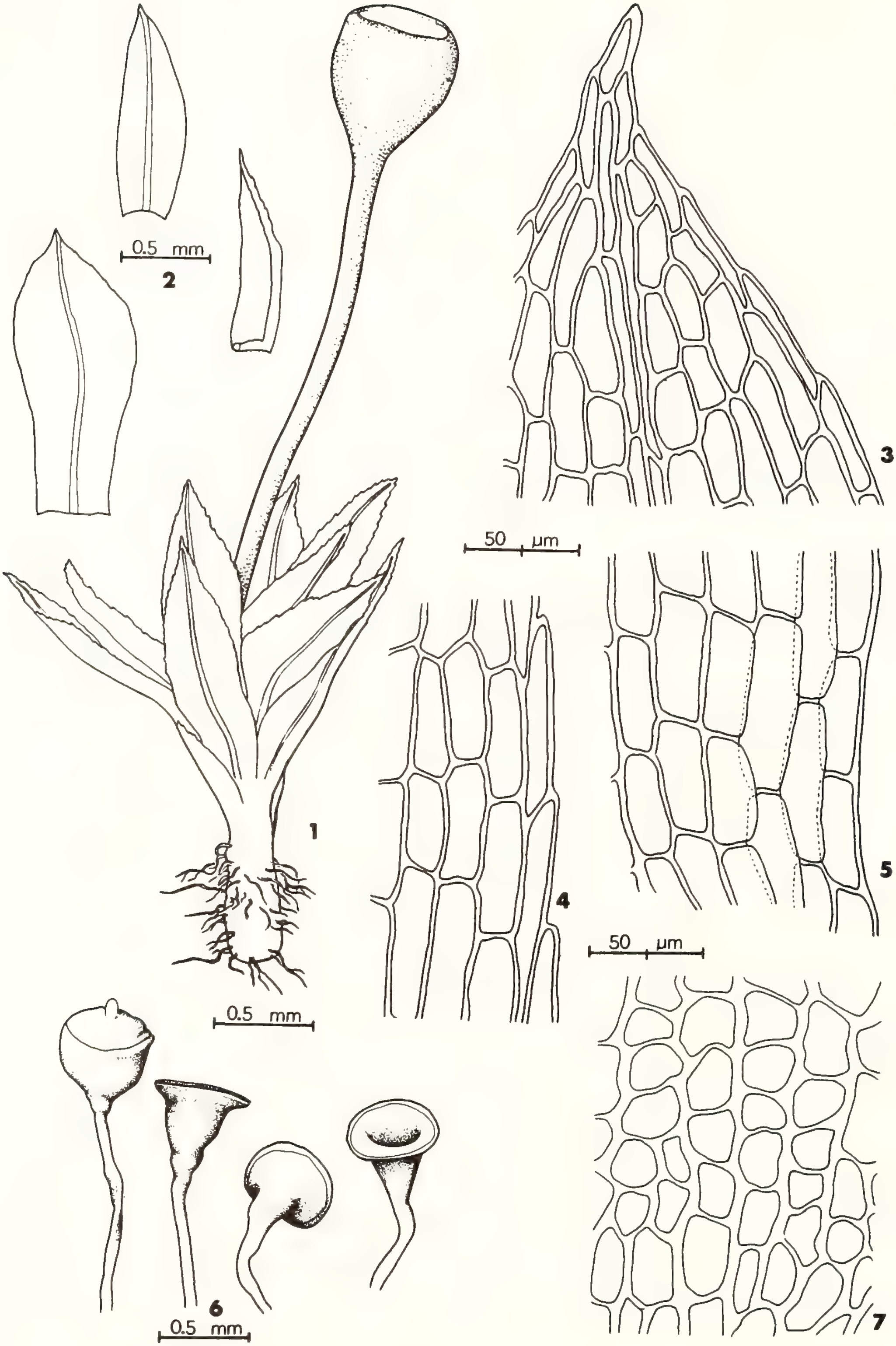
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Plate 146. *Physcomitrium collenchymatum*. 1. Habit. 2. Leaves. 3–5. Leaf cells (3, apical. 4, median-marginal. 5, alar.). 6. Capsules (dry). 7. Exothecial cells.

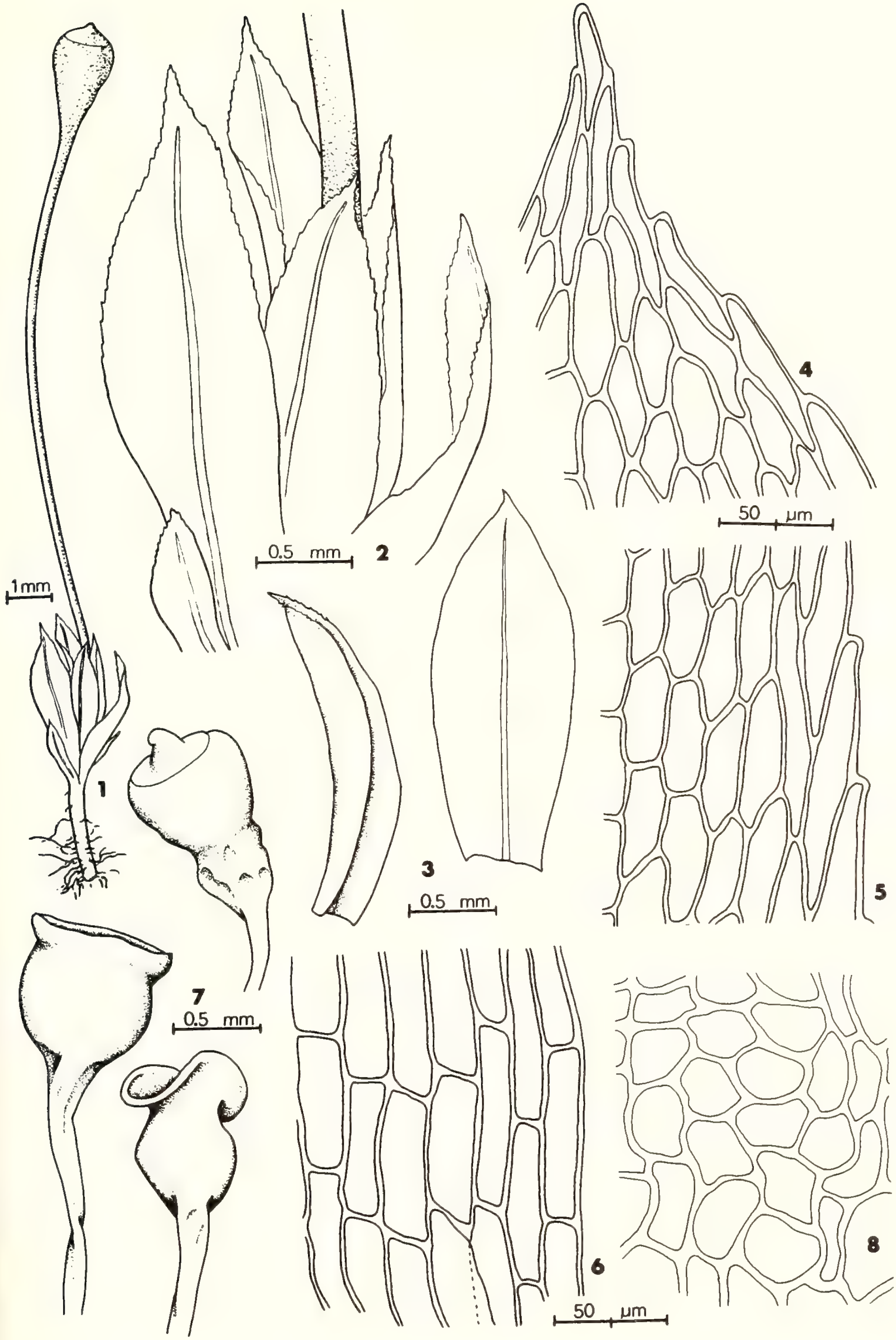
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Plate 147. *Physcomitrium pyriforme*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry). 8. Exothecial cells.

2. **Funaria** Hedw., Spec. Musc. 172. 1801.

Habit: Erect, scattered or sometimes gregarious and in loose tufts.

Colour: Light green or yellowish green, becoming brown with age.

Stems: 0.3–1.0 cm high, erect, mostly simple, sometimes with 1–2 branches near base, rhizoids at base.

Leaves: Erect and imbricate, often contorted when dry, clustered at stem apex, concave, lamina unistratose, 2–4 mm long, oblong-lanceolate to ovate-lanceolate, acute to shortly acuminate, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, entire, sometimes serrulate near apex.

Costae: Single, ending just below apex to shortly excurrent, somewhat prominent on dorsal surface.

Leaf Cells: Smooth, thin-walled, lacking pits. Median cells quadrate, hexagonal or rectangular, becoming shorter near apex and longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perichaetia at stem apices, apparently lacking paraphyses; perigonia at apices of short, basal branches, with short, usually clavate paraphyses.

Calyptrae: Cucullate, long-rostrate, naked, yellowish with a reddish beaked tip.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, oblong-pyriform, inclined to pendulous, striate or deeply sulcate when dry. Stomata usually present, confined to neck, consisting of a single, rounded guard cell with a central slit.

Setae: Straight or flexuose, smooth, twisted when dry, hygroscopic, brown to reddish brown.

Annuli: Revoluble, deciduous, of 1–2(3) rows of large cells.

Opercula: Convex to conic.

Peristomes: Double, 16 exostome teeth, lanceolate, spirally twisted, papillose-striate below, becoming papillose above, brown, endostome segments opposite the exostome teeth, often shorter.

Spores: Yellowish, globose to ovoid, minutely papillose, 14–24 μm in longest dimension.

1. **Funaria hygrometrica** Hedw., Spec. Musc. 172. 1801.

PLATE 148

Plants 0.3–1.0 cm high, leaves erect and imbricate when moist, somewhat contorted when dry, oblong-lanceolate to ovate-lanceolate, acute to shortly acuminate, concave, 2–4 mm long, margins plane, entire, sometimes serrulate at apex, costae ending just below apex to shortly excurrent, leaf cells smooth, median cells quadrate, hexagonal or rectangular, 23–94 μm in longest dimension; autoicous, capsules solitary, oblong-pyriform, inclined to pendulous, striate or deeply sulcate when dry, 2–3 mm long, exserted on long setae, 1–5 cm long, opercula convex to conic, peristome obliquely sigmoid, teeth attached at tips to a small, latticed disc, inner segments about 2/3 as long as the teeth.

Habitat: A common weed in disturbed habitats, especially on burned wood, on soil in roadside ditches, and in greenhouses.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Madawaska, Restigouche, Victoria); Nova Scotia (Annapolis, Cape Breton, Colchester, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Cosmopolitan.

Chromosome Number: n = 14, 21, 28, 56.

Remarks: Commonly called the "Cord Moss" because the seta twists like a cord when it dries.

Funaria flavicans Michx., which is known in eastern Canada from southern Ontario, may also occur in the Maritimes. It has been reported from Windsor, Nova Scotia (Erskine, 1947) but I have been unable to locate the specimen. The species is best distinguished by its short, blunt endostome segments that are about 1/4–1/2 the length of the exostome teeth.

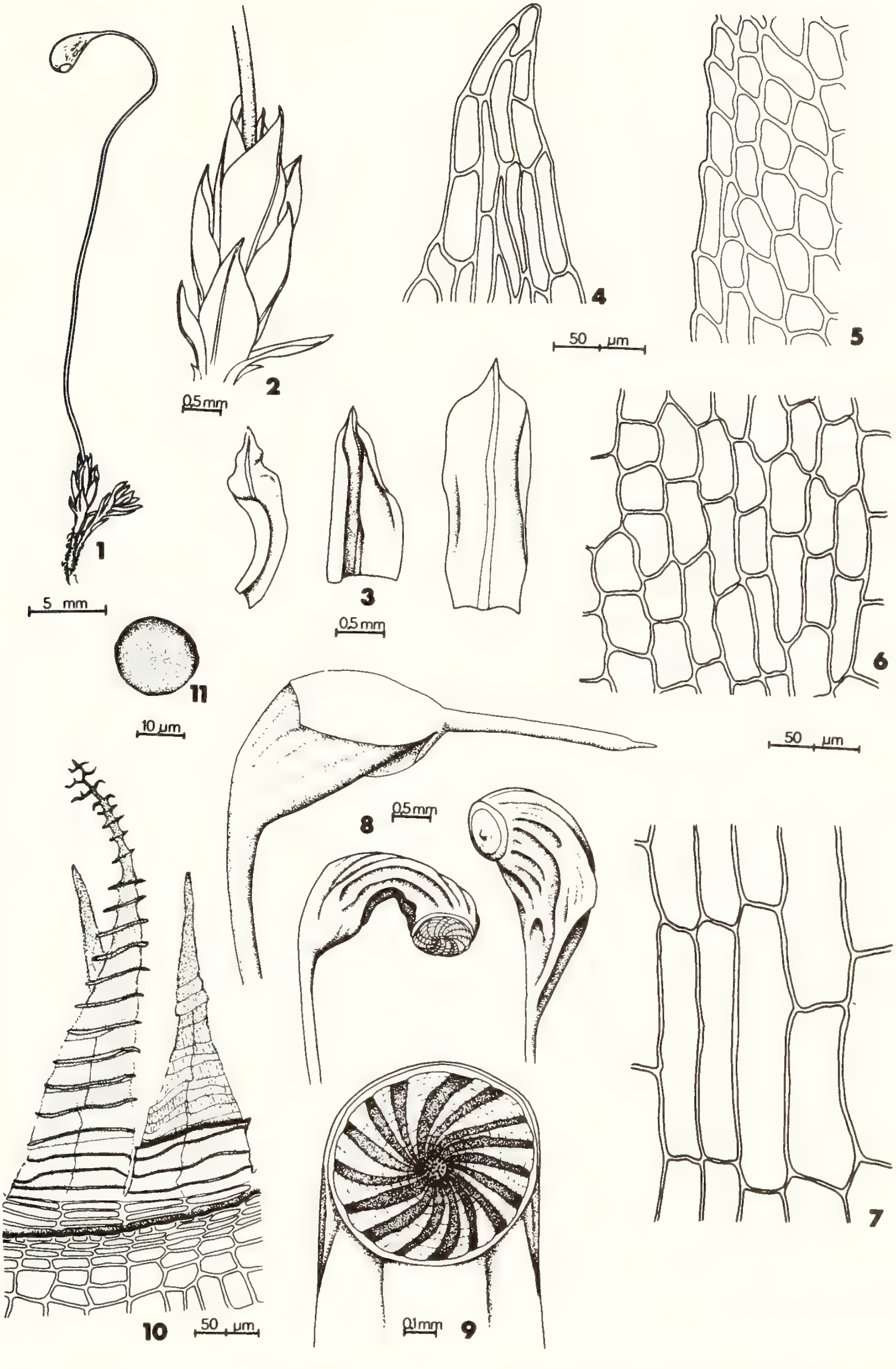
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Plate 148. *Funaria hygrometrica*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median-marginal (below apex). 6, median. 7, basal.). 8. Capsules, calyptrate (wet), acalyptrate (dry). 9. Peristome. 10. Peristome teeth. 11. Spore.

Family EPHEMERACEAE

Ephemerum Hampe, Flora 20: 285. 1837. *nom. cons.*

Habit: Erect, scattered plants with a persistent protonema.
Colour: Green to yellowish green.
Stems: 1.0–1.5 mm high including leaves, erect, simple, rhizoids at base.
Leaves: Erect-spreading, slightly contorted when dry, flat to somewhat concave, unistratose, lanceolate, acute, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane, spinose-serrate to leaf middle or below.
Costae: Lacking.
Leaf Cells: Smooth, the walls thin, lacking pits. Median cells oblong-rhomboidal, becoming rectangular near base.
Asexual Reproductive Bodies: Lacking.
Sex: Dioicous. Perigonia and perichaetia terminal.
Calyptrae: Mitrate, naked, yellowish with reddish tip.
Capsules: Solitary, immersed, on a short seta arising from stem apex, dark red to reddish brown, ovoid to globose, smooth, opening by rupture of capsule wall.
Setae: Short or nearly lacking.
Annuli: Lacking.
Opercula: Lacking.
Peristomes: Lacking.
Spores: Yellowish brown, globose or nearly so, warty, 46–89 μm.

1. **Ephemerum serratum** (Hedw.) Hampe, Flora 20: 285. 1837.
Phascum serratum Hedw., Spec. Musc. 23. 1801.
PLATE 149

Plants minute, scattered, arising from an extensive persistent protonema, stems 1.0–1.5 mm high, leaves green to yellowish green, lanceolate, acute, 1.0–1.5 mm long, erect-spreading when moist, scarcely contorted when dry, margins plane, spinose-serrate to leaf middle or below, costa lacking; sporophytes solitary at stem apex, capsules ovoid to globose, 0.3–0.5 mm at broadest point, lacking or nearly lacking seta.

Habitat: On bare, disturbed soil.
Maritime Distribution: Rare or seldom collected. Nova Scotia (Colchester, Digby, Hants, Kings).
Range: Known only from a few scattered localities in Nova Scotia, *Saskatchewan, California, *Massachusetts, *New York, New Jersey, Maryland, *Ohio, Tennessee, and Texas. Europe, *Africa.
Chromosome Number: n = 27.
Remarks: One of the smallest of all the so-called "pygmy mosses".

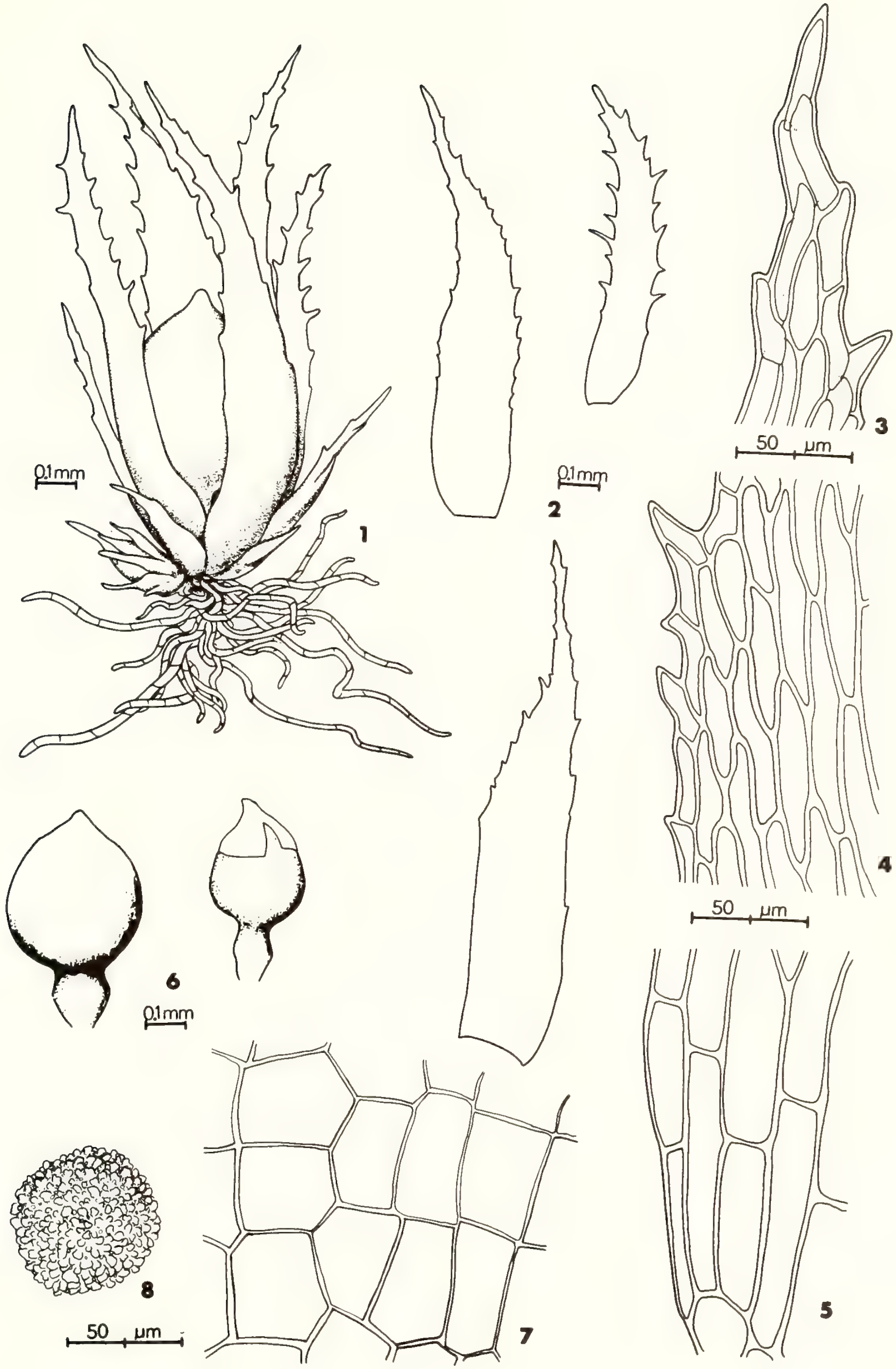
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Plate 149. *Ephemerum serratum*. 1. Habit. 2. Leaves. 3–5. Leaf cells (3, apical. 4, median-marginal. 5, alar.). 6. Capsules (dry). 7. Exothecial cells. 8. Spore.

Family SPLACHNACEAE

1. Leaves acute; capsules with hypophysis narrower or as wide as urn when wet .... 1. *Tayloria* (p. 278)
1. Leaves acuminate; capsules with hypophysis usually wider than urn 2
    2. Autoicous; capsules immersed or exserted, hypophysis slightly larger than urn and not brilliantly coloured .... 2. *Tetraplodon* (p. 280)
    2. Dioicous; capsules exserted, hypophysis distinctly wider than urn and brightly coloured, purple, red or yellow .... 3. *Splachnum* (p. 283)

1. **Tayloria** Hook., J. Sci. Arts 2(3): 144. 1816.

Habit: In erect, loose tufts.

Colour: Light green to dark green.

Stems: 0.5–1.5 cm high, erect, mostly simple or dichotomously branched, rhizoids at base.

Leaves: Erect and somewhat imbricate, contorted when dry, keeled, lamina unistratose, obovate, acute, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane above, reflexed below, serrate in the upper half.

Costae: Single, ending just below apex to percurrent, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, lacking pits. Median cells hexagonal, becoming rectangular and longer near base.

Asexual Reproductive Bodies: Multicellular, filamentous brood-bodies reported to occur on rhizoids.

Sex: Autoicous or reported to be sometimes dioicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, covering most of capsule, constricted at base, fugacious.

Capsules: Solitary, on a seta arising from the stem apex, reddish, cylindric, straight, contracted in the neck region to a narrow hypophysis, erect, shrunken when dry.

Setae: Straight, smooth, scarcely twisted when dry, reddish.

Annuli: Lacking.

Opercula: Conic, apiculate.

Peristomes: Single, consisting of 16 teeth, lanceolate, often in pairs, reflexed when dry, minutely papillose, red.

Spores: Yellow to greenish yellow, globose to ellipsoidal, smooth, 9–12 μm in longest dimension.

1. **Tayloria serrata** (Hedw.) B.S.G., Bryol. Eur. 3: 204. 284. 1844 (fasc. 23–24 Mon. 6.1).
Splachnum serratum Hedw., Spec. Musc. 53. 1801.
PLATE 150

Plants 0.5–1.5 cm high, leaves erect, obovate, margins serrate above, and cells hexagonal, 47–94 μm in longest dimension. Best recognized with sporophytes because of the erect, cylindrical capsules (1.5–3.0 mm long) that have a hypophysis which is narrower than the rest of the urn, 16 red peristome teeth that are in pairs and reflexed when dry.

Habitat: On herbivorous animal dung in woodlands.

Maritime Distribution: Rare. New Brunswick (Albert, Saint John); Nova Scotia (Digby, Halifax, Inverness, Victoria).

Range: Labrador, Newfoundland, Nova Scotia, New Brunswick, Quebec, Alberta, British Columbia, continental Northwest Territories, Vermont, Washington, and Alaska. Europe, *Asia.

Chromosome Number: Unreported.

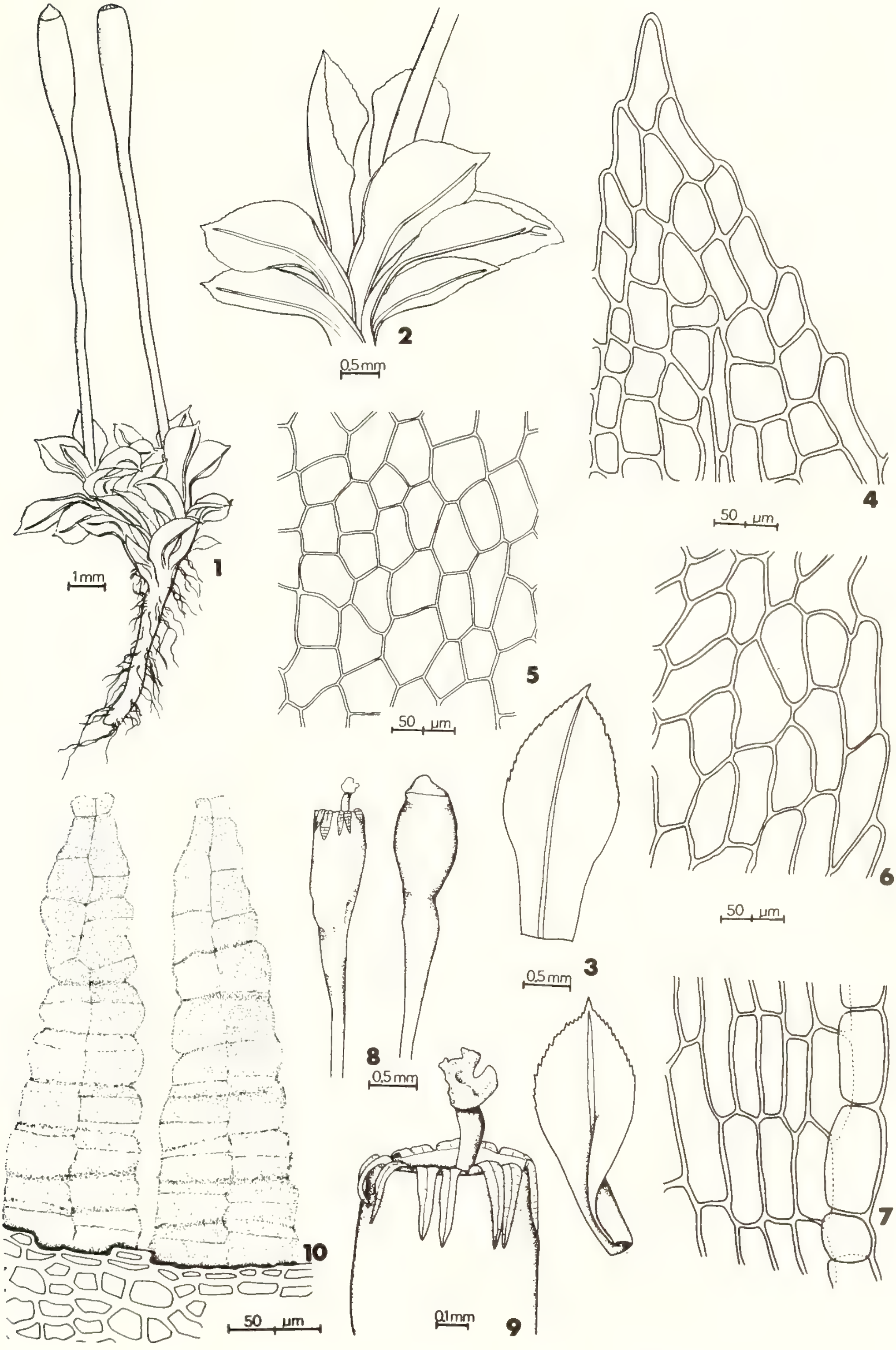
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Plate 150. *Tayloria serrata*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Peristome. 10. Peristome teeth.

2. **Tetraplodon** B.S.G., Bryol. Eur. 3: 211. 1844 (fasc. 23–24 Mon. 1).

Habit: In erect, loose to dense tufts.

Colour: Light green or yellowish green above, brown below.

Stems: 1–6 cm high, erect, simple or dichotomously branched, rhizoids extending up stem close to apex.

Leaves: Erect to erect-spreading, flexuose-contorted when dry, keeled or concave, lamina unistratose, lanceolate, ovate-lanceolate or oblanceolate, acuminate, often abruptly so, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or inrolled, entire or toothed.

Costae: Single, ending below apex to percurrent, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, lacking pits. Median cells hexagonal to rectangular, becoming rectangular and longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous. Perichaetia terminal, perigonia on axillary branches.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, immersed to exserted, on a seta arising from stem apex, dark red, sometimes blackish with age, cylindric, straight, expanded in the neck region to a slightly wider hypophysis when wet, erect, wrinkled and often narrower when dry, same colour as urn or brownish yellow.

Setae: Straight, smooth, scarcely twisted when dry, orange to red.

Annuli: Lacking.

Opercula: Conic, apiculate.

Peristomes: Single, consisting of 16 teeth, lanceolate, often in pairs, reflexed when dry, minutely papillose, orange to red.

Spores: Yellow to greenish yellow, globose to ellipsoidal, smooth, 7–12 μm in longest dimension.

1. Leaves entire or nearly so, concave; setae long, 10–30 mm in length, capsules exserted above upper leaves .... 1. *T. mnioides*
1. Leaves toothed, keeled; setae short, 2–6 mm in length, capsules not or scarcely exserted above leaves .... 2. *T. angustatus*

1. Tetraplodon mnioides (Hedw.) B.S.G., Bryol. Eur. 3: 215. 289. 1844 (fasc. 23–24 Mon. 5.2).
Splachnum mnioides Hedw., Spec. Musc. 51. 1801.
[Synonym: *T. bryoides* Lindb.]
PLATE 151

Plants with ovate-lanceolate or oblanceolate, concave leaves, inrolled, entire or nearly entire margins, erect, cylindrical capsules, dark red, blackish with age, with a hypophysis that is broader than the rest of the urn, and long setae, 10–30 mm long, exserting the capsules far above the leaves.

Habitat: On dung (presumably carnivores) and decaying animal remains in bogs and woodlands.

Maritime Distribution: Rare. New Brunswick (Charlotte, Saint John, Victoria); Nova Scotia (Inverness, Victoria).

Range: In all Canadian provinces and territories except Prince Edward Island. Known in the United States from New Hampshire, Washington, Oregon, and Alaska. Greenland, Central and South America, Europe, Asia.

Chromosome Number: n = 8, 11, 19.

2. Tetraplodon angustatus (Hedw.) B.S.G., Bryol. Eur. 3: 214. 288. 1844 (fasc. 23–24 Mon. 4.1).
Splachnum angustatum Hedw., Spec. Musc. 51. 1801.
PLATE 152

Plants with lanceolate, keeled leaves, plane, toothed margins, erect, cylindrical capsules, dark red with a brownish yellow hypophysis that is broader than the rest of the urn, and short setae, 2–6 mm, scarcely exserting the capsules above the leaves.

Habitat: On dung (presumably carnivores) and decaying animal remains in woodlands.

Maritime Distribution: Rare. New Brunswick (Charlotte, King's); Nova Scotia (Halifax, Inverness, Victoria).

Range: Labrador, Newfoundland, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Alberta, British Columbia, Yukon Territory, continental Northwest Territories, Maine, and Alaska. Greenland, Europe, Asia.

Chromosome Number: n = 10.

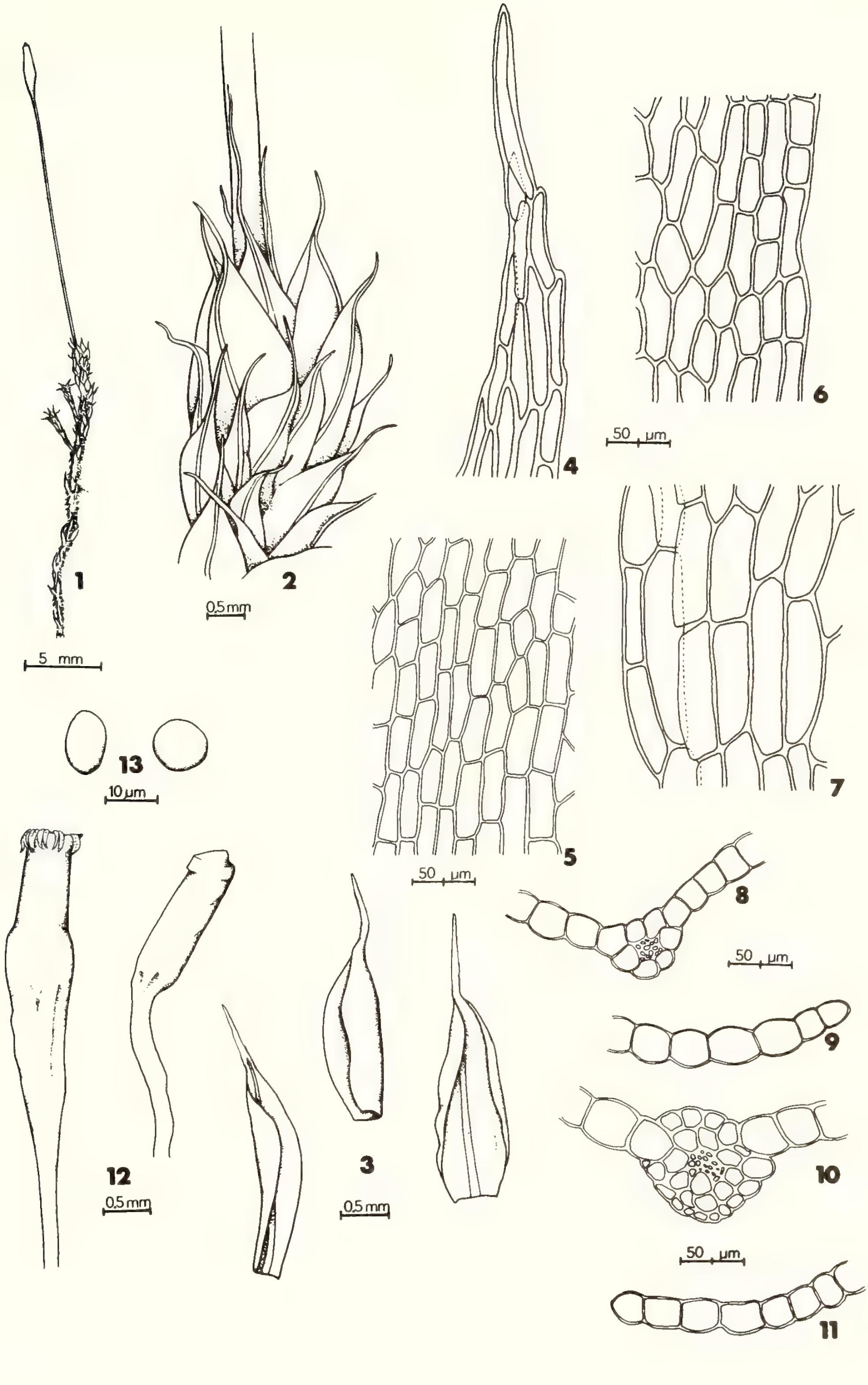
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Plate 151. *Tetraplodon mnioides*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical, 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of costa above middle. 9. Cross-section of marginal cells above middle. 10. Cross-section of costa near base. 11. Cross-section of marginal cells near base. 12. Capsules (dry). 13. Spores.

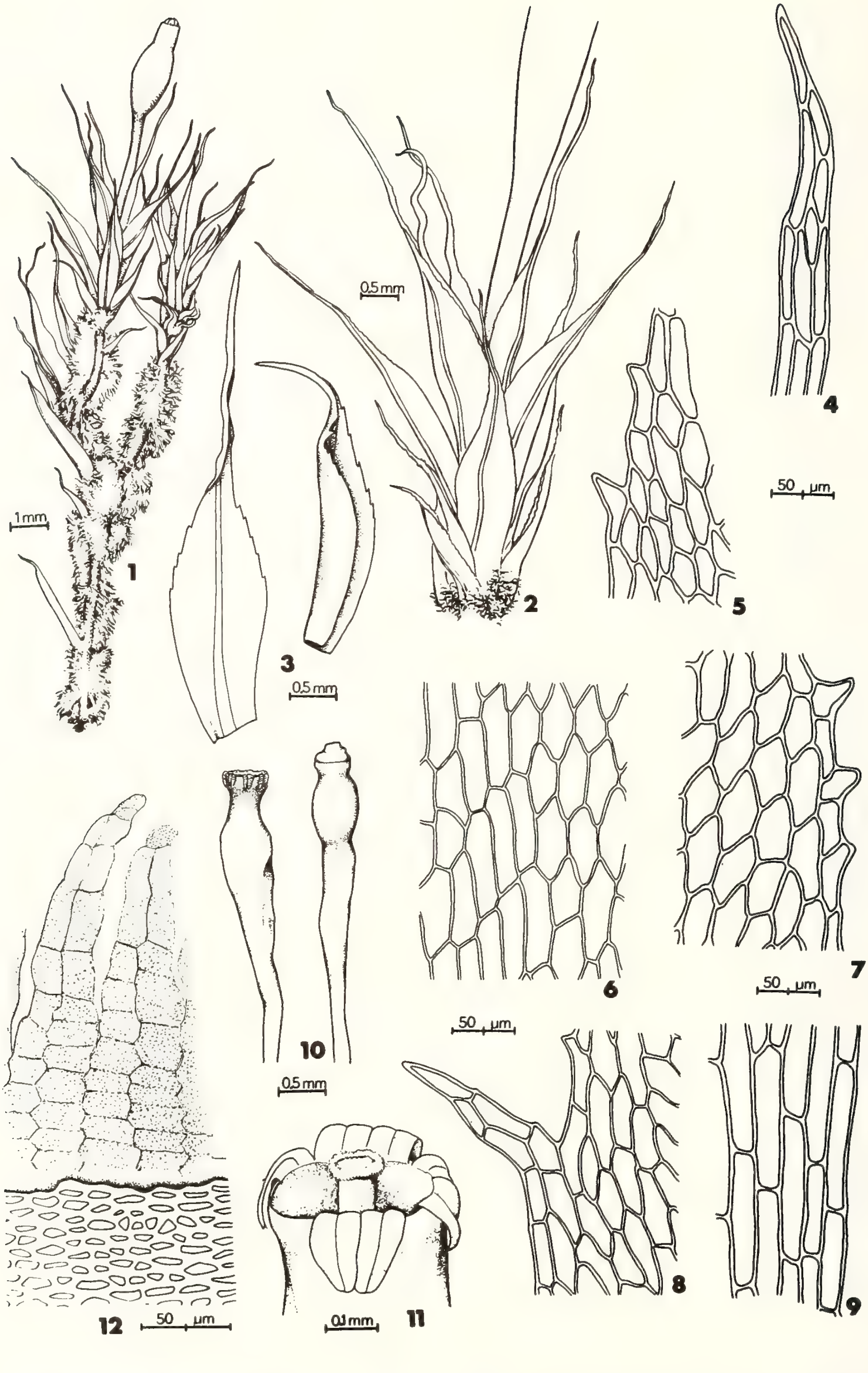
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Plate 152. *Tetraplodon angustatus*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4–5, apical. 6, median. 7, median-marginal.). 8. Marginal tooth from median part of leaf. 9. Alar cells of leaf. 10. Capsules (dry). 11. Peristome. 12. Peristome teeth.

3. **Splachnum** Hedw., Spec. Musc. 51. 1801.

Habit: In erect, loose tufts.
Colour: Light green or yellowish green.
Stems: 1–4 cm high, erect, mostly simple or dichotomously branched, rhizoids at base.
Leaves: Erect to erect-spreading, flexuose-contorted when dry, keeled, lamina unistratose, lanceolate to ovate or obovate, acute to acuminate, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane, sometimes reflexed below, serrate or toothed with large, multicellular teeth, sometimes nearly entire.
Costae: Single, ending below apex to percurrent, scarcely prominent on dorsal surface.
Leaf Cells: Smooth, the walls of medium thickness, lacking pits. Median cells hexagonal, becoming rectangular and longer near base.
Asexual Reproductive Bodies: Lacking.
Sex: Dioicous. Perigonia and perichaetia terminal. Male plants often somewhat smaller than female.
Calyptrae: Cucullate, naked, yellowish, reaching to the hypophysis, fugacious.
Capsules: Solitary, on a seta arising from the stem apex, erect, consisting of an upper cylindric, often orange or red urn and below an expanded campanulate or turbinate, yellow, pink, red or purple hypophysis, smooth or wrinkled.
Setae: Straight to flexuose, smooth, scarcely twisted when dry, orange to red.
Annuli: Lacking.
Opercula: Conic, apiculate.
Peristomes: Single, consisting of 16 teeth, lanceolate, often in pairs, reflexed when dry, minutely papillose, orange to red.
Spores: Yellow to greenish yellow, globose to ellipsoidal, smooth, 7–12 μm in longest dimension.

1. Leaf margins toothed with large, multicellular teeth; hypophysis turbinate, pink to light purple, wrinkled when dry .... 3. *S. ampullaceum*
1. Leaf margins toothed with small, unicellular teeth, sometimes entire; hypophysis campanulate, yellow, dark red or purple, smooth when dry 2
    2. Leaf margins toothed nearly to base; hypophysis dark red to purple .... 2. *S. rubrum*
    2. Leaf margins toothed only to middle of leaf; hypophysis yellow .... 1. *S. luteum*

1. Splachnum luteum Hedw., Spec. Musc. 56. 1801.
PLATE 153

An easily recognized species because of the large, yellow, umbrella-shaped capsules which readily distinguishes it from *S. rubrum* with its red to purple capsules. The hypophysis is shallow and flared in contrast to the deeply concave one of *S. rubrum*. When sterile the species may be distinguished from *S. ampullaceum* by the small teeth on the leaf margins and from *S. rubrum* by the restriction of the teeth to the upper part of the leaves.

Habitat: On dung (presumably herbivores) in woods.
Maritime Distribution: Rare. New Brunswick (Kent). Known only from a single collection made by *J. Fowler*, 21 May 1872, but without specific locality data.
Range: New Brunswick, Ontario, *Quebec, Saskatchewan, Alberta, British Columbia, Yukon Territory, and continental Northwest Territories. Europe, *Asia.
Chromosome Number: Unreported.
Remarks: Commonly called the "Umbrella Moss" or "Petticoat Moss" because of the odd capsule.

2. Splachnum rubrum Hedw., Spec. Musc. 56. 1801.

PLATE 154

Unmistakable because of the large, bright red to purple, umbrella-shaped capsules. Sterile plants are distinguished from *S. ampullaceum* by the small teeth on the leaf margins and from *S. luteum* by the presence of teeth in the lower part of the leaf.

Habitat: On dung (presumably herbivores) in woods.

Maritime Distribution: Rare. New Brunswick (Queen's, Sunbury); Nova Scotia (Cumberland).

Range: Nova Scotia, New Brunswick, Quebec, Ontario, Saskatchewan, Alberta, and British Columbia. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: A rare but beautiful moss with red to purple capsules. Like *S. luteum* it too is known as "Umbrella Moss" or "Petticoat Moss".

3. Splachnum ampullaceum Hedw., Spec. Musc. 55. 1801.

PLATE 155

Distinguished by the pink to light purple, turbinate capsules. The large multicellular teeth on the leaf margins will separate this species from the other two in the genus when sterile.

Habitat: On dung (presumably herbivores) in bogs, swamps and woodlands.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Queen's, Saint John, York); Nova Scotia (Annapolis, Cape Breton, Cumberland, Inverness, Queens, Richmond, Victoria).

Range: Newfoundland to Ontario, south to Maine, New Hampshire, Vermont, *West Virginia, and Michigan; disjunct to Alberta and British Columbia. *South America, Europe, *Asia.

Chromosome Number: n = 8, 10.

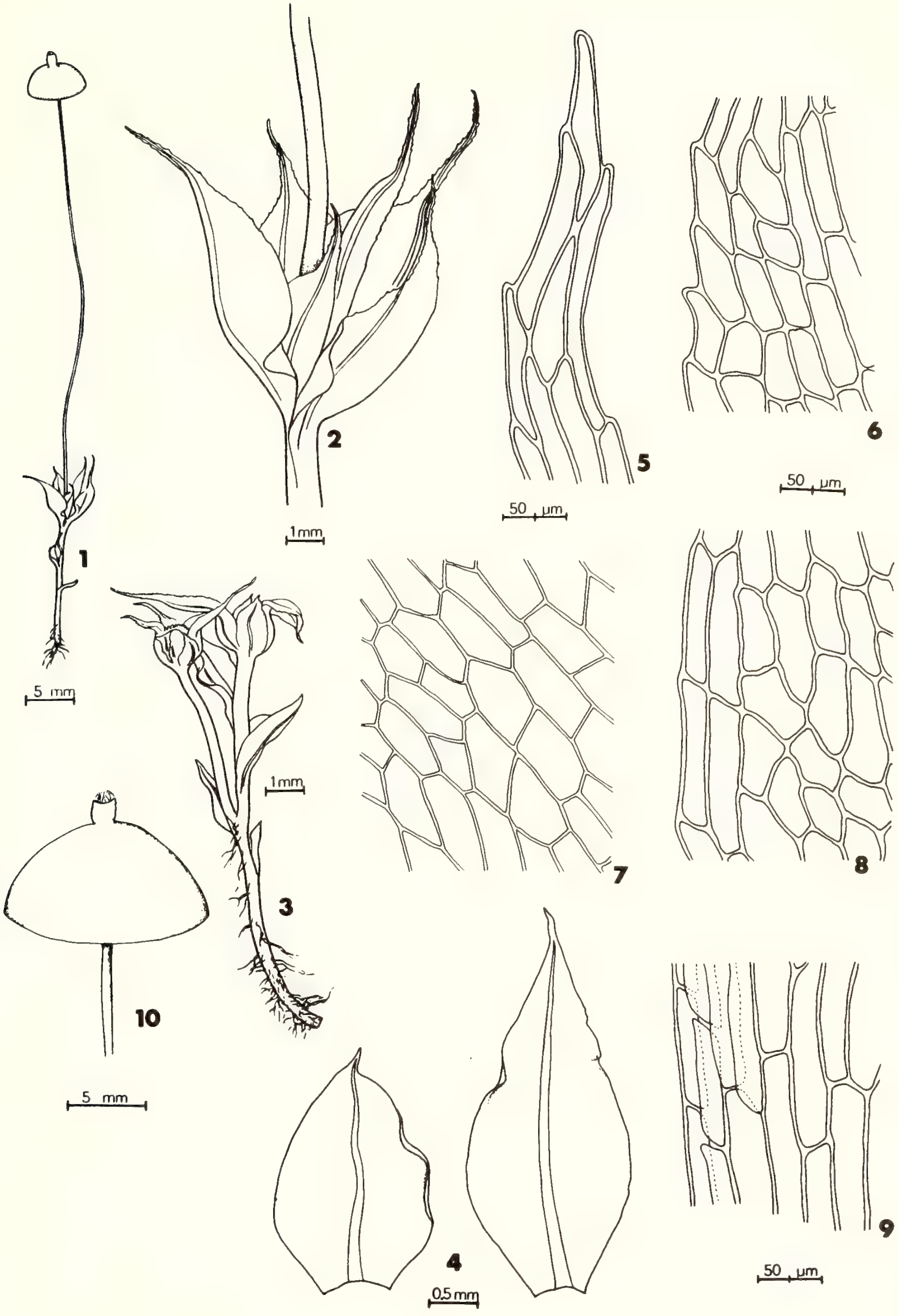
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Plate 153. *Splachnum luteum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–9. Leaf cells (5–6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Capsule (wet).

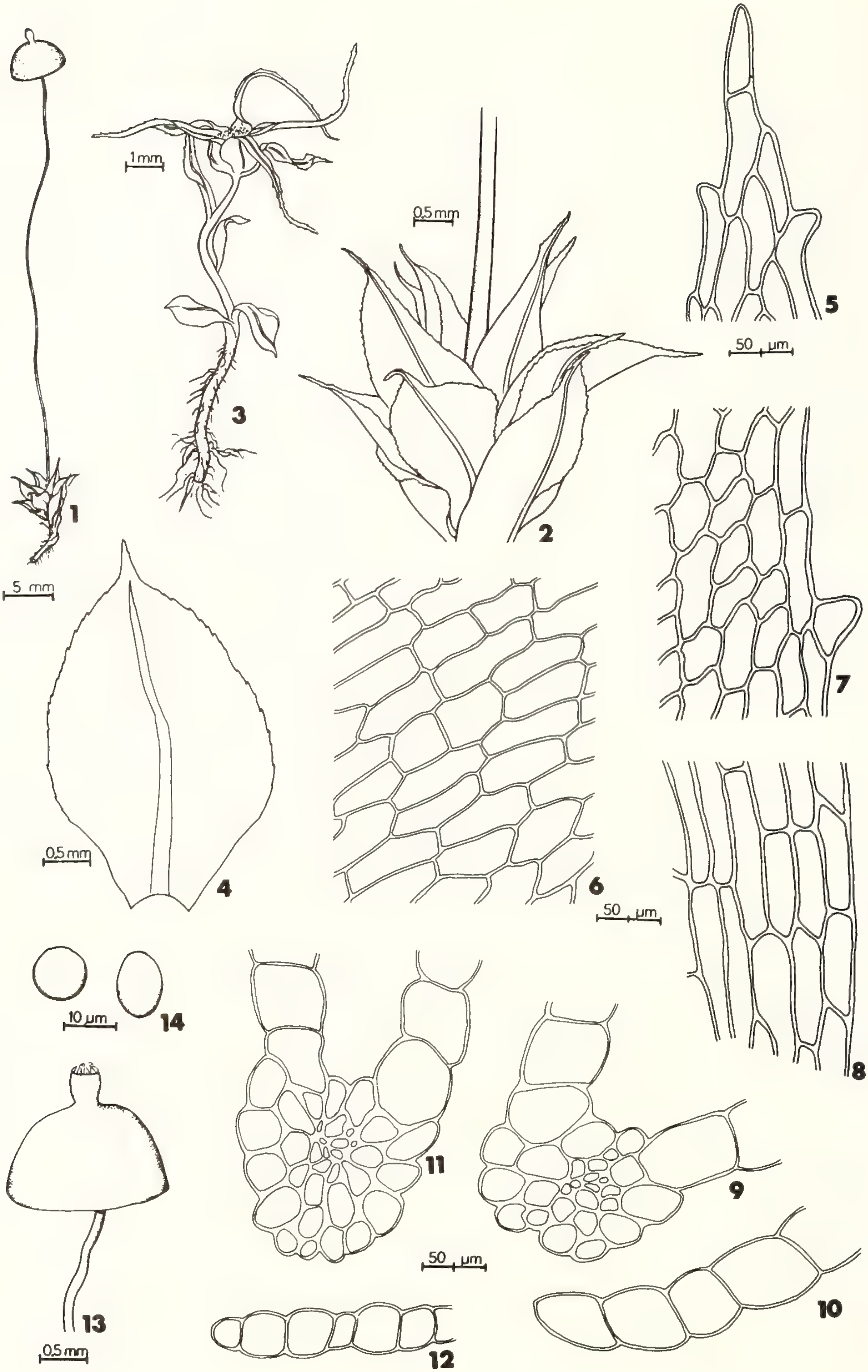
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Plate 154. *Splachnum rubrum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of costa above middle. 10. Cross-section of marginal cells above middle. 11. Cross-section of costa near base. 12. Cross-section of marginal cells near base. 13. Capsule (wet). 14. Spores.

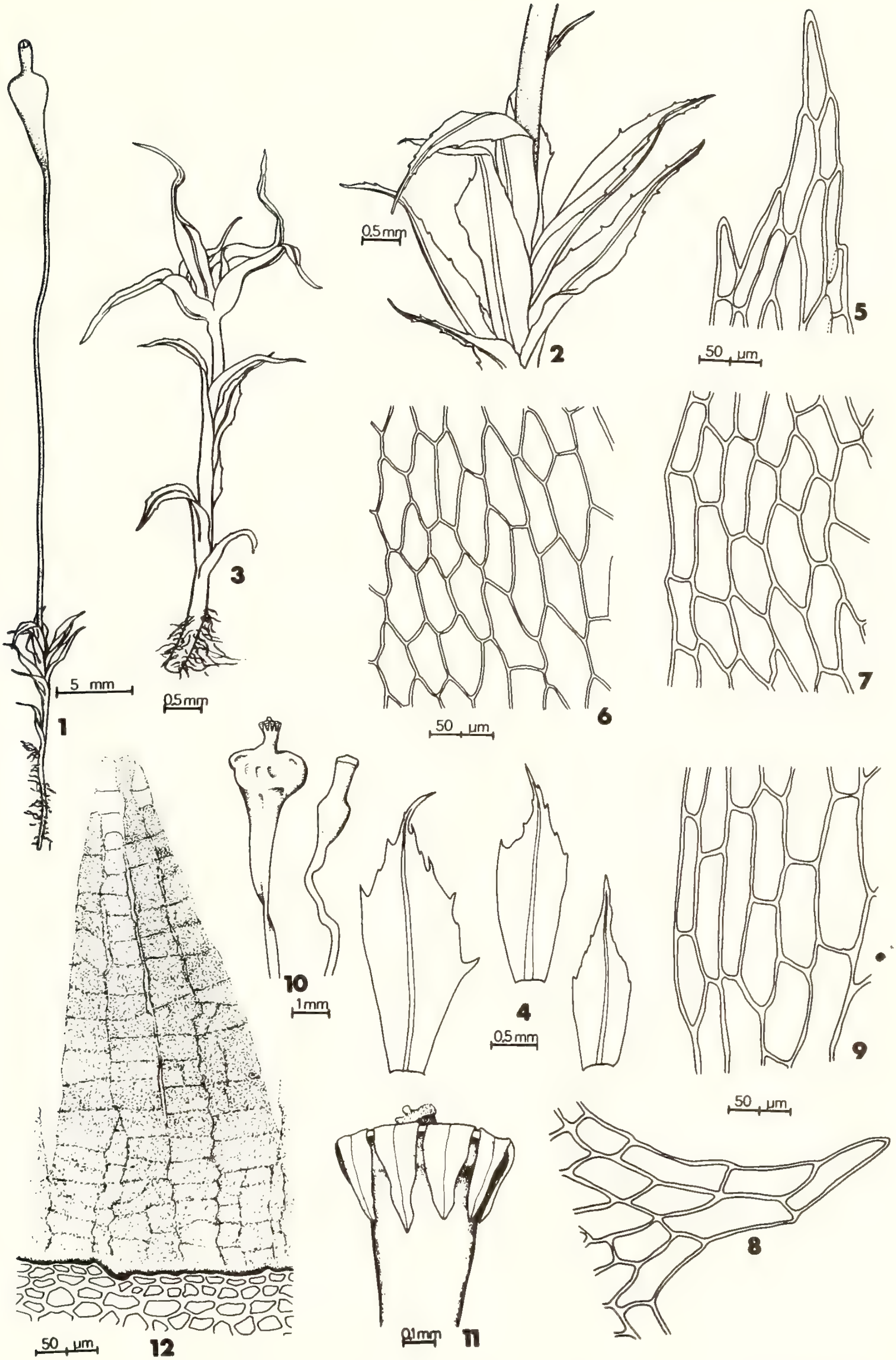
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Plate 155. *Splachnum ampullaceum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median. 7, median-marginal.). 8. Marginal tooth from median part of leaf. 9. Alar cells of leaf. 10. Capsules (dry). 11. Peristome. 12. Peristome teeth.

Family BRYACEAE

1. Leaves narrow, linear to subulate, the costa occupying most of upper part of leaf .... 3. *Leptobryum* (p. 306)
1. Leaves broad, lanceolate to ovate, the costa occupying only a small portion of leaf 2
    2. Stems rosulate; leaf margins serrate to toothed above; setae aggregate .... 5. *Rhodobryum* (p. 332)
    2. Stems not rosulate; leaf margins entire to serrate above; setae solitary 3
        3. Plants large and julaceous, leaves ca. 1 mm long, whitish with a pinkish tinge; sporophytes unknown on Maritime plants .... 2. *Plagiobryum* (p. 304)
        3. Plants not julaceous or if so, small with leaves less than 1 mm long; sporophytes common 4
            4. Median leaf cells short, 4:1 or less; leaf margins often with differentiated border of elongated cells .... 4 *Bryum* (p. 308)
            4. Median leaf cells long, 4:1 or more; leaf margins lacking differentiated border .... 1. *Pohlia* (p. 288)

1. **Pohlia** Hedw., Spec. Musc. 171. 1801.

Habit: In erect, loose to dense tufts.

Colour: Green, whitish green or yellowish green, often shiny.

Stems: 0.5–4.0 cm high, sometimes red, erect, simple or forked, rhizoids at base.

Leaves: Erect-spreading to imbricate, little changed when dry, concave to keeled, unistratose, linear-lanceolate to ovate-lanceolate, sometimes ovate or oblong, acute to acuminate, rarely obtuse, nondecurrent or decurrent. Perichaetial leaves sometimes differentiated.

Leaf Margins: Plane or recurved, serrulate to serrate above, entire below, rarely entire throughout.

Costae: Single, subpercurrent to shortly excurrent, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls thin or somewhat thickened, nonpitted or pits indistinct. Median cells rhomboidal to linear, becoming broader near base.

Asexual Reproductive Bodies: Lacking or present and variable, 1-several multicellular gemmae in leaf axils, round to obovoid or linear, sometimes twisted with 1–4 points at apex.

Sex: Paroicous, autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown to brown, pyriform, ovoid or cylindric, with a short or long neck, straight, inclined to pendulous, smooth, wrinkled at neck when dry, stomata phaneropore or cryptopore.

Setae: Straight to flexuose, usually curved or hooked below capsule, smooth, not or little twisted when dry, yellow, orange, red or brown.

Annuli: Lacking or usually present, deciduous, revoluble, of 1–3 rows of cells.

Opercula: Conic to short-rostrate.

Peristomes: Double, perfect, bryaceous, exostome yellow or brown to reddish brown, endostome with 2–3 cilia, nodulose or somewhat appendiculate.

Spores: Yellow to yellowish brown, globose, minutely papillose, 12–24 μm.

1. Plants with gemmae in leaf axils 2
    2. Gemmae scarce, one per axil, round or obovoid bodies 3
        3. Gemmae red when mature .... 4. *P. andalusica*
        3. Gemmae yellow or green when mature .... 5. *P. bulbifera* (in part)
    2. Gemmae numerous, 2-several per leaf axil, linear, round or obovoid bodies 4
        4. Gemmae round or obovoid, 2–3 per leaf axil, lacking points at apex .... 5. *P. bulbifera* (in part)
        4. Gemmae linear, often more than 3 per leaf axil, with points at apex 5
            5. Gemmae with a single point or sometimes 2–3 points at apex ... 6. *P. proligera*
            5. Gemmae with 2–4 points at apex .... 7. *P. annotina*

1. Plants lacking gemmae 6
    6. Plants julaceous, leaves strongly concave, imbricate .... 1. *P. filiformis*
    6. Plants not julaceous, leaves flat to weakly concave, spreading 7
        7. Capsules about as wide as long 8
            8. Plants green or yellow; capsules with superficial stomata ...... 2. *P. lescuriana*
            8. Plants whitish green; capsules with immersed stomata ...... 3. *P. wahlenbergii*
        7. Capsules decidedly longer than wide 9
            9. Capsules long and slender, about 6–8 times as long as wide, with a neck of equal or greater length than rest of capsule .... 8. *P. elongata*
            9. Capsules short and broad, about 3–5 times as long as wide, with a neck much shorter than rest of capsule 10
                10. Plants whitish green; perichaetial leaves differentiated, narrower and longer than other leaves .... 11. *P. cruda*
                10. Plants yellowish green to dark green 11
                    11. Plants paroicous; leaf margins serrate; spores 18–20 μm; common, occurring in a variety of habitats in both wet and dry situations .... 9. *P. nutans*
                    11. Plants dioicous; leaf margins entire to serrulate; spores 14–18 μm; rare, occurring in bogs .... 10. *P. sphagnicola*

1. Pohlia filiformis (Dicks.) Andrews, Moss Fl. N. Amer. 2: 205. 1935.
Bryum filiforme Dicks., Pl. Crypt. Brit. fasc. 4: 16. 1801.
[Synonym: *Anomobryum filiforme* (Dicks.) Solms]
PLATE 156

Plants erect, in loose to dense tufts, yellowish green, stems julaceous, 0.5–1.5 cm high; leaves imbricate, ovate to oblong, obtuse to acute, nondecurrent, 0.5–1.5 mm long, margins plane, entire or minutely serrulate above, costae subpercurrent to percurrent, median cells 47–99 × 7–9 μm; gemmae lacking; Maritime plants sterile, reported to be dioicous, capsules cylindric, 2.5 mm long, stomata phaneropore.

Habitat: On soil in crevices of cliff.

Maritime Distribution: Rare. New Brunswick (Albert). Known from one locality in Fundy National Park, Bay of Fundy, near Point Wolfe, 8 July 1968 (*Ireland 11571, 11572*).

Range: Occurring sporadically in Labrador, Newfoundland, New Brunswick, Quebec, Ontario, British Columbia, Yukon Territory, *Northwest Territories, New York, Tennessee, Michigan, Minnesota, Missouri, Kansas, Colorado, and California. Central and South America, West Indies, Europe, *Asia, *Africa.

Chromosome Number: n = 10.

Remarks: Inoperculate capsule drawn from Mexican plant and operculate capsule from Michigan plant.

2. Pohlia lescuriana (Sull.) Grout, Mosses Handl. Microsc. 210. 1906.
Bryum lescurianum Sull., Mem. Amer. Ac. Arts. Sci. n. ser. 4: 171. 1849.
[Synonym: *P. pulchella* (Hedw.) Lindb.]
PLATE 157

Plants erect, in loose tufts, green to yellowish green, stems 0.5–1.0 cm high; leaves erect to somewhat spreading, lanceolate, acuminate, nondecurrent, 1–3 mm long, margins narrowly recurved, serrulate above, costae subpercurrent to percurrent, median cells 61–122 × 9–12 μm; gemmae lacking; dioicous, capsules short-pyriform, 0.8–1.5 mm long, stomata phaneropore.

Habitat: On soil in exposed and disturbed habitats.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Kent, Madawaska, Westmorland, York); Nova Scotia (Colchester, Guysborough, Halifax, Hants); Prince Edward Island (Queens).

Range: Labrador to Quebec, south to Virginia and Michigan; also known from *British Columbia. Europe, *Asia.

Chromosome Number: Unreported.

3. Pohlia wahlenbergii (Web. & Mohr) Andrews, Moss Fl. N. Amer. 2: 203. 1935.
Hypnum wahlenbergii Web. & Mohr, Bot. Taschenb. 280. 1807.
[Synonyms: *P. albicans* (Wahlenb.) Lindb.; *Mniobryum albicans* (Wahlenb.) Limpr.; *M. wahlenbergii* (Web. & Mohr) Jenn.]
PLATE 158

Plants erect, in loose to dense tufts, yellowish green, light green or whitish green, stems 1–3 cm high, usually red; leaves erect to erect-spreading, lanceolate to ovate-lanceolate, acute, decurrent, 1–2 mm long, margins plane, serrate above, costae subpercurrent, median cells 42–141 × 9–19 μm, becoming long and narrow on margins; gemmae lacking; dioicous, Maritime plants lacking sporophytes, reported to have ovoid capsules, 1–2 mm long, stomata cryptopore.

Habitat: On soil in exposed and disturbed habitats, sometimes beside streams.

Maritime Distribution: Frequent. New Brunswick (Albert, Queen's, Restigouche, Victoria); Nova Scotia (Hants, Inverness, Lunenburg); Prince Edward Island (Kings).

Range: Greenland to Alaska, south to North Carolina, Tennessee, Arkansas, Nebraska, New Mexico, Arizona, and California. Central and South America, Europe, Asia, *Africa, *Australia, *New Zealand.

Chromosome Number: n = 10, 11.

Remarks: Operculate capsule drawn from British Columbia plant and inoperculate capsule from Ontario plant.

4. Pohlia andalusica (Höhn.) Broth., Nat. Pfl. 1(3): 551. 1903.
Webera andalusica Höhn., Sitzungsber. Ak. Wiss. Wien Math. Nat. Kl. Abt. 1, 104: 326. 1895.
[Synonym: *P. rothii* auct., *non* (Corr. *ex* Limpr.) Broth.]
PLATE 159

Plants erect, in loose to dense tufts, yellowish green, stems 1–3 cm high; leaves erect, imbricate, ovate-lanceolate, acuminate, decurrent, 1.0–1.5 mm long, margins recurved, serrulate above, costae subpercurrent to percurrent, median cells 33–75 × 7–9 μm; gemmae present in leaf axils, red, one per leaf, round to obovoid bodies; dioicous, capsules long-pyriform, 1.5–3.0 mm long, stomata phaneropore.

Habitat: On soil in exposed and disturbed sites.

Maritime Distribution: Common. New Brunswick (Gloucester, Victoria, Westmorland); Nova Scotia (Annapolis, Halifax, Shelburne); Prince Edward Island (Kings, Prince, Queens).

Range: Labrador to Quebec, south to New Hampshire and New York; also known from Yukon Territory, Michigan, and Alaska. Europe.

Chromosome Number: Unreported.

Remarks: The name *P. rothii* (Corr. *ex* Limpr.) Broth. was previously applied to plants that fit the above description. However, J. Shaw (personal communication) recently discovered that *P. rothii* is a synonym of *P. filum* (Schimp.) Mart., a species not known from the Maritime Provinces, and *P. andalusica* should be used for plants fitting the present description.

5. Pohlia bulbifera (Warnst.) Warnst., Krypt. Fl. Brandenburg 2: 429. 1904.
Webera bulbifera Warnst., Bot. Centralbl. 66: 230. 1896.
PLATE 160

Plants erect, in loose tufts, green to yellowish green stems 1.0–1.5 cm high; leaves erect-spreading, ovate-lanceolate, acute to shortly acuminate, decurrent, 1–2 mm long, margins plane, serrulate above, costae subpercurrent to percurrent, median cells 38–80 × 9–14 μm; gemmae present in leaf axils, yellow or green, 1 or sometimes 2–3 per leaf, round or obovoid bodies; dioicous, capsules elongate-ovate, 2–3 mm long, stomata phaneropore.

Habitat: On soil in exposed and usually disturbed habitats.

Maritime Distribution: Frequent. New Brunswick (Charlotte, King's, York); Nova Scotia (Annapolis, Halifax, Queens, Sable Island).

Range: Labrador to *Manitoba, south to New York and Michigan; known in the West from Alberta, British Columbia, Yukon Territory, and Alaska. Europe, *Asia.

Chromosome Number: Unreported.

6. Pohlia proligera (Kindb. *ex* Breidl.) Lindb. *ex* H. Arnell, Bot. Not. 1894: 54. 1894.
Webera proligera Kindb. *ex* Breidl., Mitteil. Naturweiss. Ver. Steiermark 28: 122. 1891.
PLATE 161

Plants erect, gregarious or in loose tufts, yellowish green, stems 1–2 cm high; leaves erect to erect-spreading, somewhat twisted and contorted when dry, ovate-lanceolate, acute, shortly decurrent, 1–2 mm long, margins plane or recurved, serrulate above, costae subpercurrent to percurrent, median cells 42–113 × 7–9 μm; gemmae present in leaf axils, yellow or green, 2-several per leaf, linear bodies with 1 or sometimes 2–3 points at apex; dioicous, capsules long-pyriform, 2–3 mm long, stomata phaneropore.

Habitat: On soil in exposed and disturbed habitats, sometimes in crevices of cliffs.

Maritime Distribution: Frequent. New Brunswick (Albert, Restigouche, Westmorland); Nova Scotia (Colchester, Kings, Victoria).

Range: Greenland to Alaska, south to New York, Michigan, Minnesota, Colorado, and California. Europe, *Asia.

Chromosome Number: n = 11.

7. **Pohlia annotina** (Hedw.) Lindb., Musci Scand. 17. 1879.
Bryum annotinum Hedw., Spec. Musc. 183. 1801.
[Synonyms: *P. annotina* var. *decipiens* Loeske; *P. annotina* var. *loeskei* Crum, Steere & Anders.]
PLATE 162

Plants erect, in loose tufts, yellowish green, stems 1.0–1.5 cm high; leaves erect-spreading, lanceolate, acuminate, decurrent, 1.0–1.5 mm long, margins plane, somewhat recurved when dry, serrulate above, costae subpercurrent to percurrent, median cells 47–132 × 5–9 μm; gemmae present in leaf axils, yellow or green, 2–5 per leaf, linear to somewhat ovoid bodies, often spirally twisted, with 2–4 points at apex; dioicous, capsules long-pyriform, 2–3 mm long, stomata phaneropore.

Habitat: On soil in exposed and often disturbed habitats.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Cumberland, Halifax, Kings, Lunenburg, Shelburne, Victoria); Prince Edward Island (Queens).

Range: Newfoundland to Alaska, south to *Georgia, Tennessee, *Michigan, *Wisconsin, Iowa, Colorado, Montana, Idaho, and California. Europe, *Asia, *Africa.

Chromosome Number: n = 11, 13, 14.

Remarks: Lewis and Smith (1977, 1978) studied the gametophytic characters of *P. annotina* and the other gemmiferous species of *Pohlia* section *Pohliella* in Britain using experimental methods. Utilizing growth studies, they discovered that there is a vast amount of variation in the axillary gemmae (bulbils) which have been used to separate *P. annotina*, var. *decipiens* Loeske and *P. proligera* (Kindb. *ex* Breidl.) Lindb. *ex* H. Arnell and these vegetative propagules cannot be used to distinguish them. Since no other important taxonomic characters could be found to separate the three taxa they concluded that *P. annotina* and the var. *decipiens* should be considered synonyms of *P. proligera* which is the oldest acceptable name. Although I agree that the gemmae are of no importance in distinguishing the var. *decipiens* (Fig. 12.) from the var. *annotina* (Fig. 9), I have some reservations in regard to combining *P. annotina* with *P. proligera* so I have left both as distinct species.

8. **Pohlia elongata** Hedw., Spec. Musc. 171. 1801.
[Synonym: *P. acuminata* (Hoppe & Hornsch.) Schimp.]
PLATE 163

Plants erect, in loose tufts, green to yellowish green, stems 1–2 cm high; leaves erect-spreading, ovate-lanceolate on lower part of stems, linear-lanceolate above, acuminate, nondecurrent, 1–4 mm long, margins plane or recurved, serrulate above, costae subpercurrent to percurrent, median cells 56–112 × 7–9 μm; gemmae lacking; paroicous or autoicous, capsules cylindric, the neck of equal or greater length than rest of capsule, 3–5 mm long, stomata phaneropore.

Habitat: On soil over rock ledges or in crevices of cliffs.

Maritime Distribution: Rare. New Brunswick (Albert, Kent, Restigouche); Nova Scotia (Halifax, Queens).

Range: Labrador to Ontario, south in the mountains to North Carolina and Tennessee; also known from *Alberta, British Columbia, *Northwest Territories, Wisconsin, Minnesota, Iowa, and Colorado. Europe, Asia, *Africa.

Chromosome Number: n = 11.

9. **Pohlia nutans** (Hedw.) Lindb., Musci Scand. 18. 1879.
Webera nutans Hedw., Spec. Musc. 168. 1801.
PLATE 164

Plants erect, in loose tufts, green or yellowish green, stems 0.5–3.0 cm high; leaves erect, somewhat twisted and contorted when dry, lanceolate to ovate-lanceolate, acuminate, nondecurrent, 1–5 mm long, margins recurved, sometimes plane, serrulate above, costae subpercurrent to shortly excurrent, median cells 24–90 × 9–14 μm; gemmae lacking; paroicous, capsules elongate-ovate, 2–4 mm long, stomata phaneropore, spores 18–20 μm.

Habitat: On soil, humus, rotten logs and stumps in clearings or woodlands, sometimes in bogs.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Madawaska, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth, Sable Island); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to *Georgia, Arkansas, Kansas, Colorado, Arizona, and California. South America, Europe, Asia, *Africa, *Australia, *New Zealand, *Pacific Islands.

Chromosome Number: n = 11, 14, 20, 21, 22, 33.

Remarks: This *Pohlia* is the most common of all the Maritime species and probably the most common in North America.

10. **Pohlia sphagnicola** (B.S.G.) Lindb. & H. Arnell, K. Svenske Vet. Akad. Handl. 23(10): 53. 1890.
Bryum sphagnicola B.S.G., Bryol. Eur. 4: 156. 349. 1846. (fasc. 32 Mon. Suppl. 1: 6.7).
PLATE 165

Plants erect, in loose tufts, green or yellowish green, stems 1–3 cm high; leaves erect, twisted and contorted when dry, lanceolate to ovate-lanceolate, acute to acuminate, sometimes narrowly obtuse, nondecurrent, 1–2 mm long, margins plane or often recurved, entire to serrulate above, costae subpercurrent, median cells 24–71 × 7–12 μm; gemmae lacking; dioicous, capsules elongate-ovate, 2–3 mm long, stomata phaneropore, spores 14–18 μm.

Habitat: In *Sphagnum* hummocks in bogs.

Maritime Distribution: Rare. Nova Scotia (Kings); Prince Edward Island (Kings).

Range: *Newfoundland, Prince Edward Island, Nova Scotia, Ontario, Quebec, *Manitoba, Alberta, *British Columbia, *Yukon Territory, and Northwest Territories. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: Possibly only an environmental form of *Pohlia nutans*.

11. **Pohlia cruda** (Hedw.) Lindb., Musci Scand. 18. 1879.
Mnium crudum Hedw., Spec. Musc. 189. 1801.
PLATE 166

Plants erect, in loose tufts, yellowish green, light green or whitish green, stems 2–4 cm high; leaves erect-spreading, ovate to ovate-lanceolate on lower part of stems, lanceolate above, acute to acuminate, decurrent, 2–5 mm long, margins plane, somewhat recurved when dry, serrulate above, costae subpercurrent, median cells 108–202 × 9–12 μm; gemmae lacking; dioicous or paroicous, capsules oblong-cylindric, 2–4 mm long, stomata phaneropore.

Habitat: On soil or humus, often on shaded rock ledges or in crevices of cliffs, sometimes on rotten logs.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Restigouche, Westmorland, York); Nova Scotia (Colchester, Guysborough, Inverness, Kings, Victoria); Prince Edward Island (Queens).

Range: Greenland to Alaska, south to Tennessee, Michigan, Iowa, Colorado, Arizona, and California. *Central and South America, Europe, Asia, *Africa, *Australia, New Zealand, *Pacific Islands.

Chromosome Number: n = 10, 11, 14, 22, 40.

Remarks: The leaves have a metallic sheen that aids in the recognition of this species.

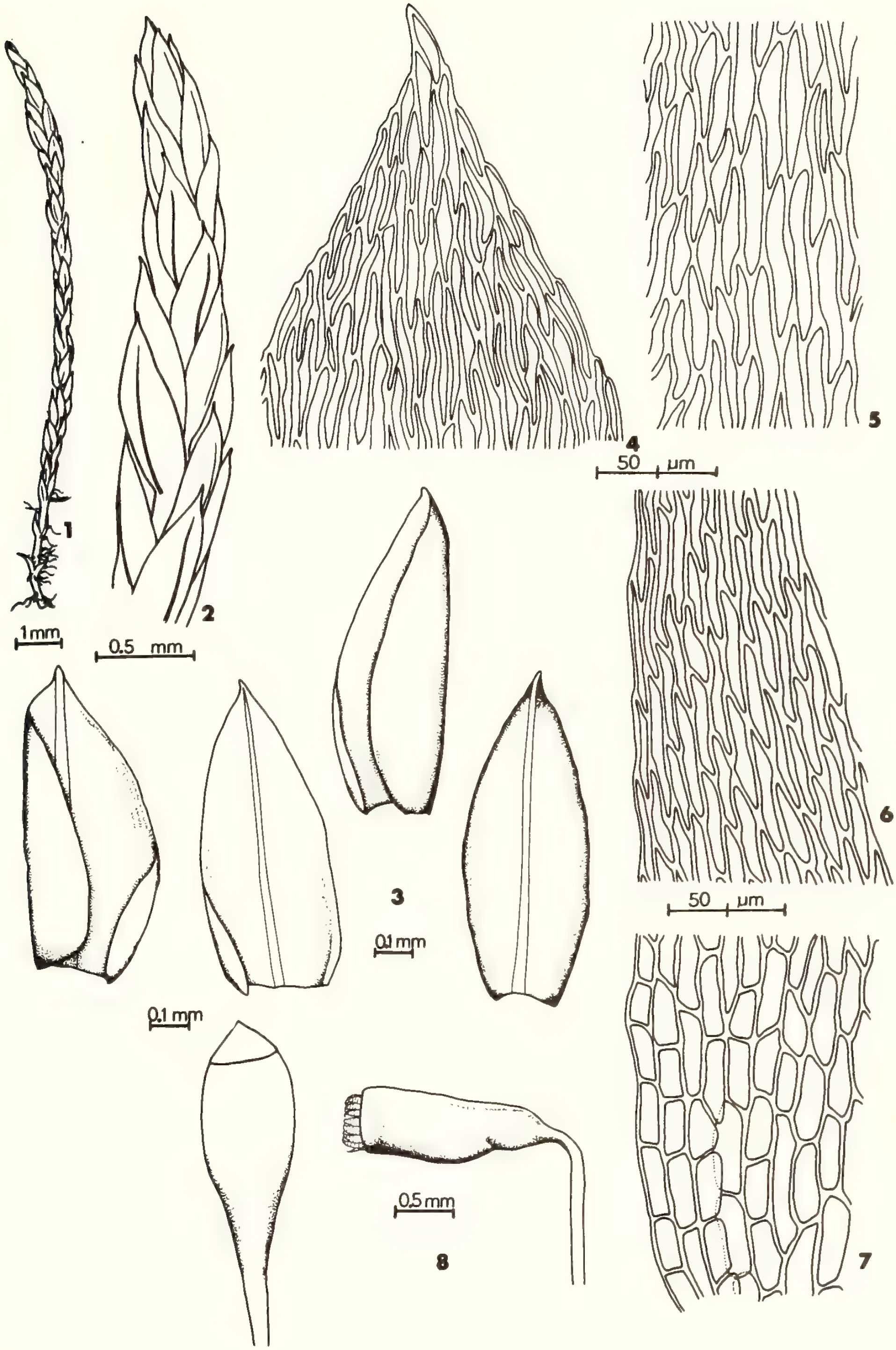
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Plate 156. *Pohlia filiformis*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

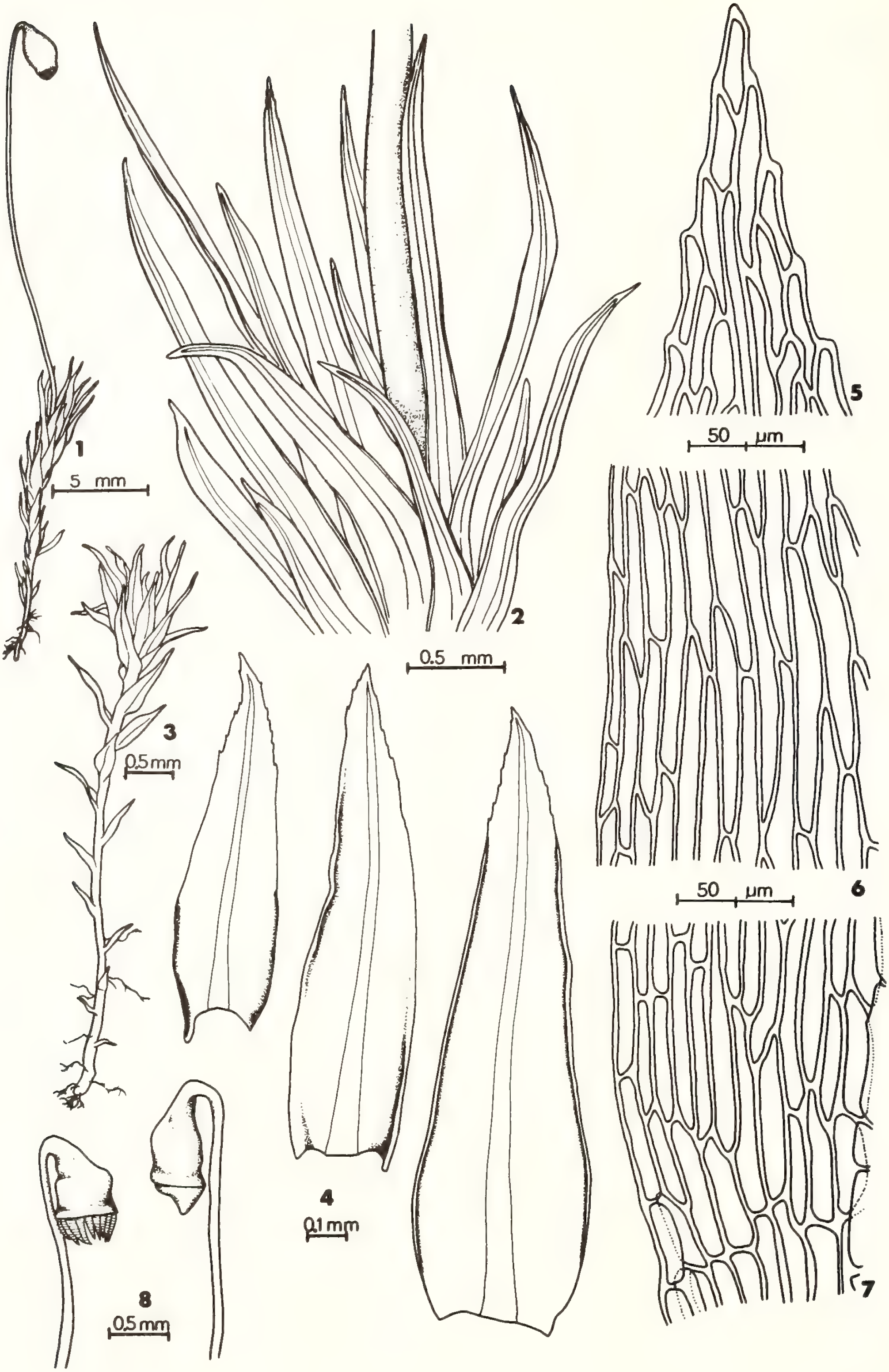
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Plate 157. *Pohlia lescuriana*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry).

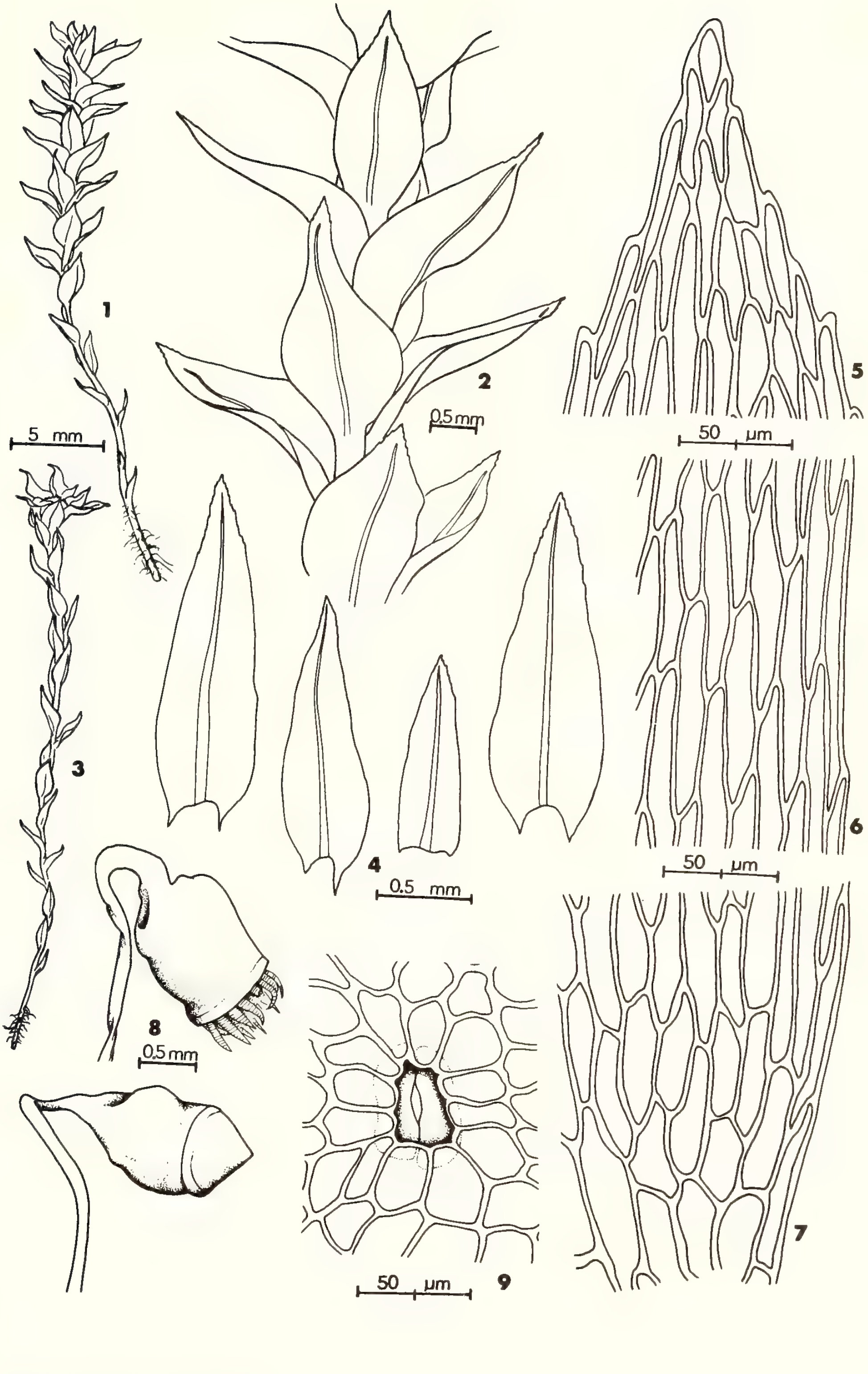
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Plate 158. *Pohlia wahlenbergii*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Stomate.

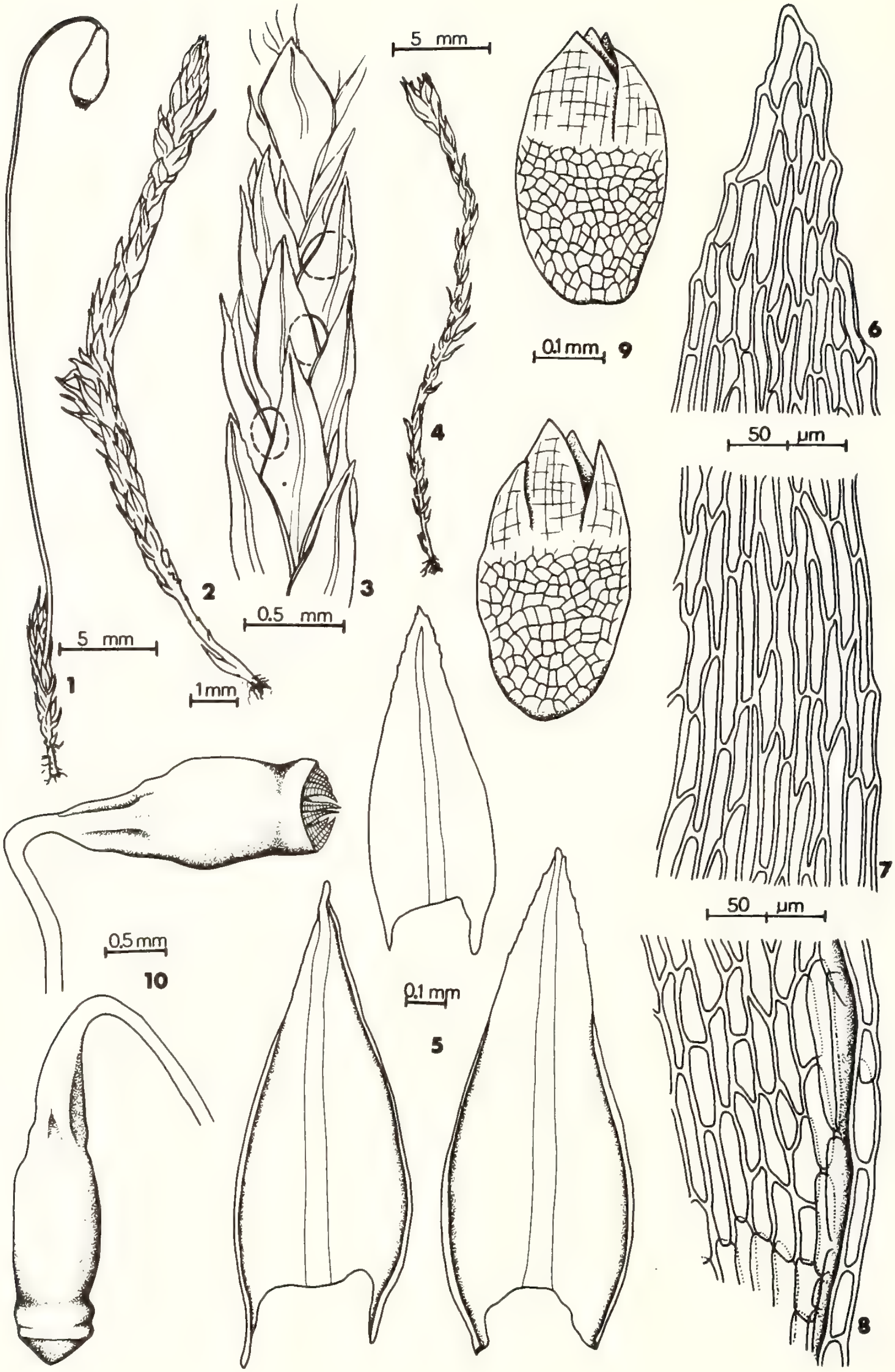
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Plate 159. *Pohlia andalusica*. 1. Habit of fruiting plant. 2. Habit of gemmiferous plant. 3. Portion of stem of gemmiferous plant. 4. Male plant. 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Gemmae. 10. Capsules (dry).

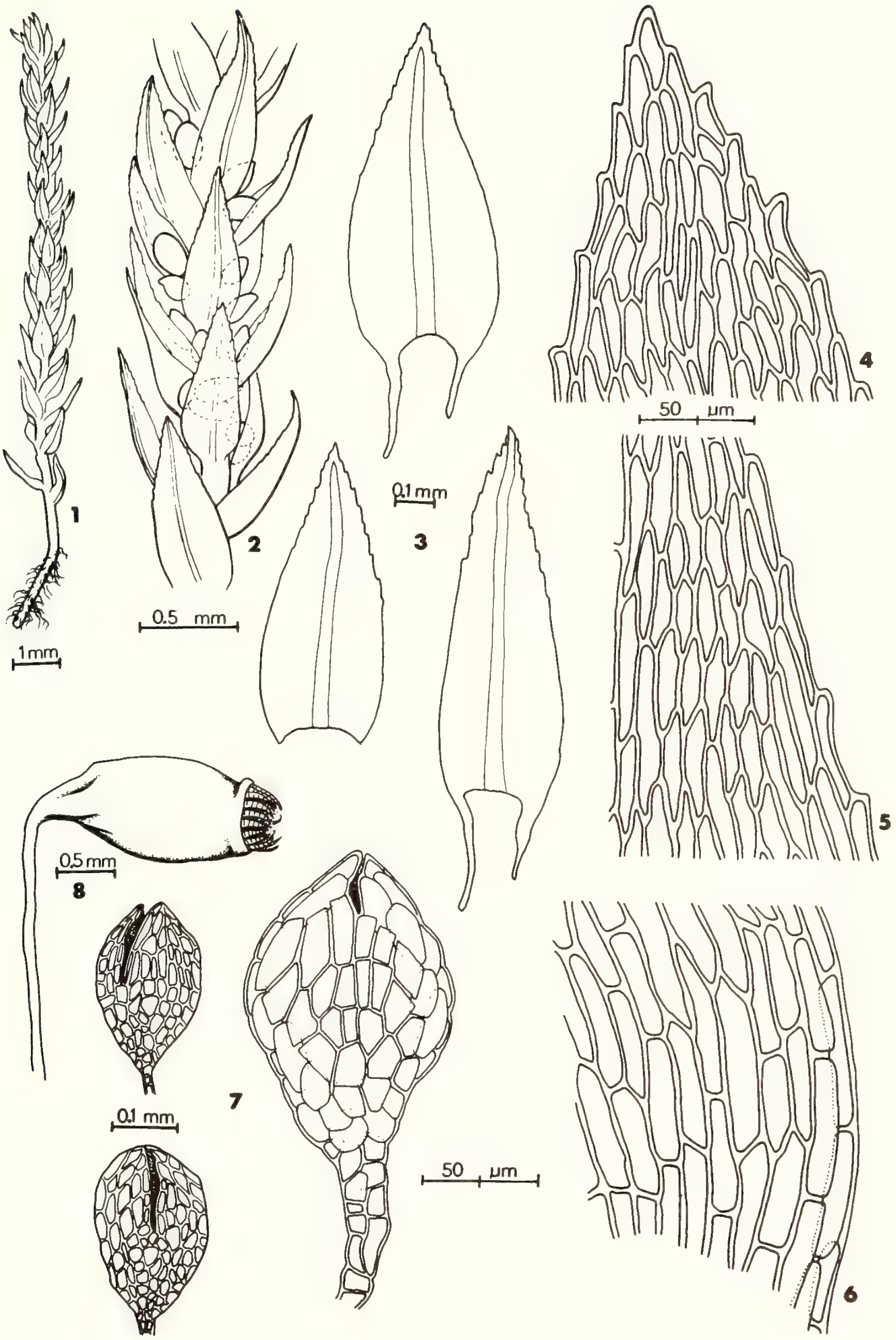
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Plate 160. *Pohlia bulbifera*. 1. Habit of gemmiferous plant. 2. Portion of stem of gemmiferous plant. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Gemmae. 8. Capsule (dry).

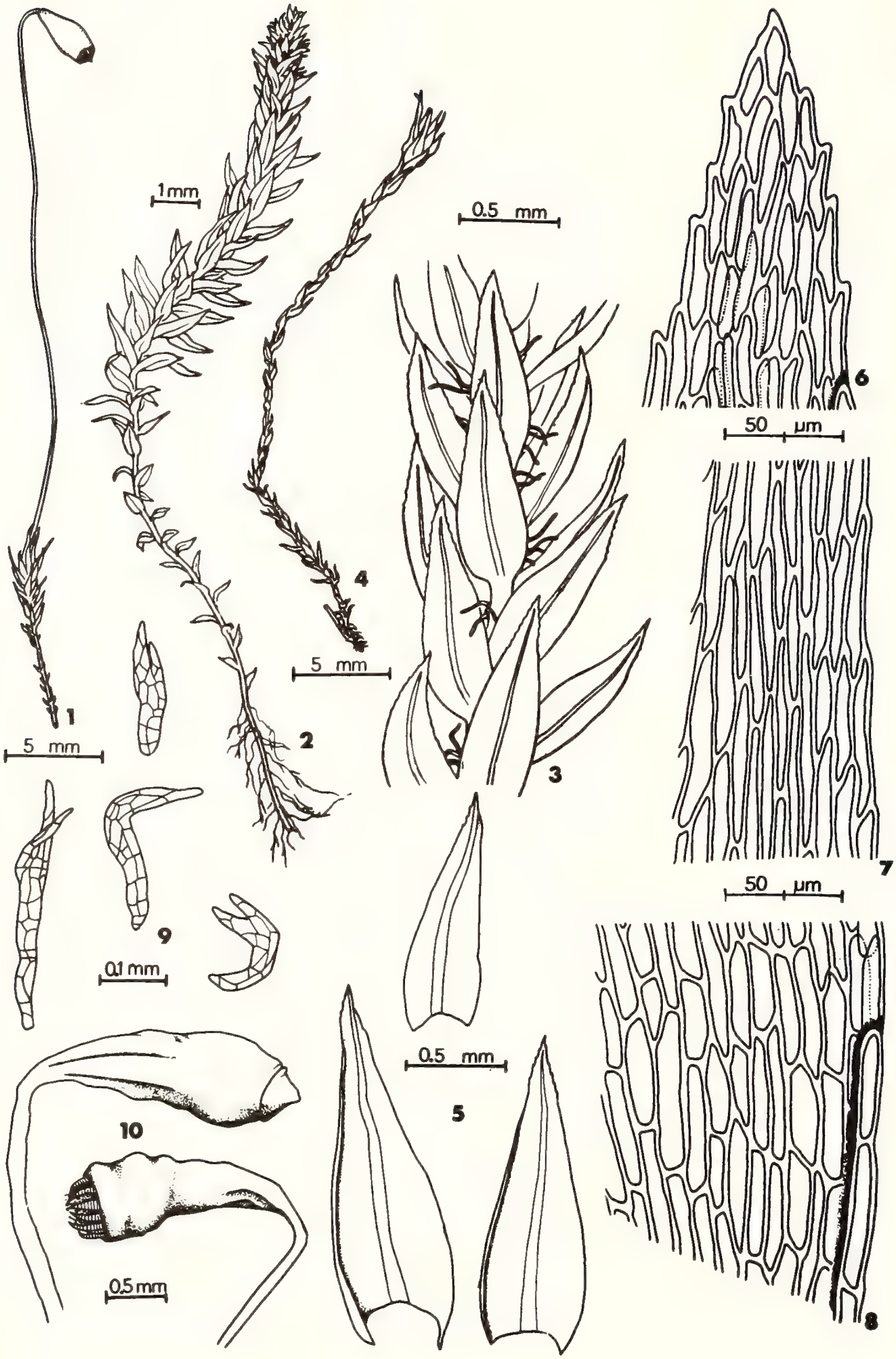
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Plate 161. *Pohlia proligera*. 1. Habit of fruiting plant. 2. Habit of gemmiferous plant. 3. Portion of stem of gemmiferous plant. 4. Male plant. 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Gemmae. 10. Capsules (dry).

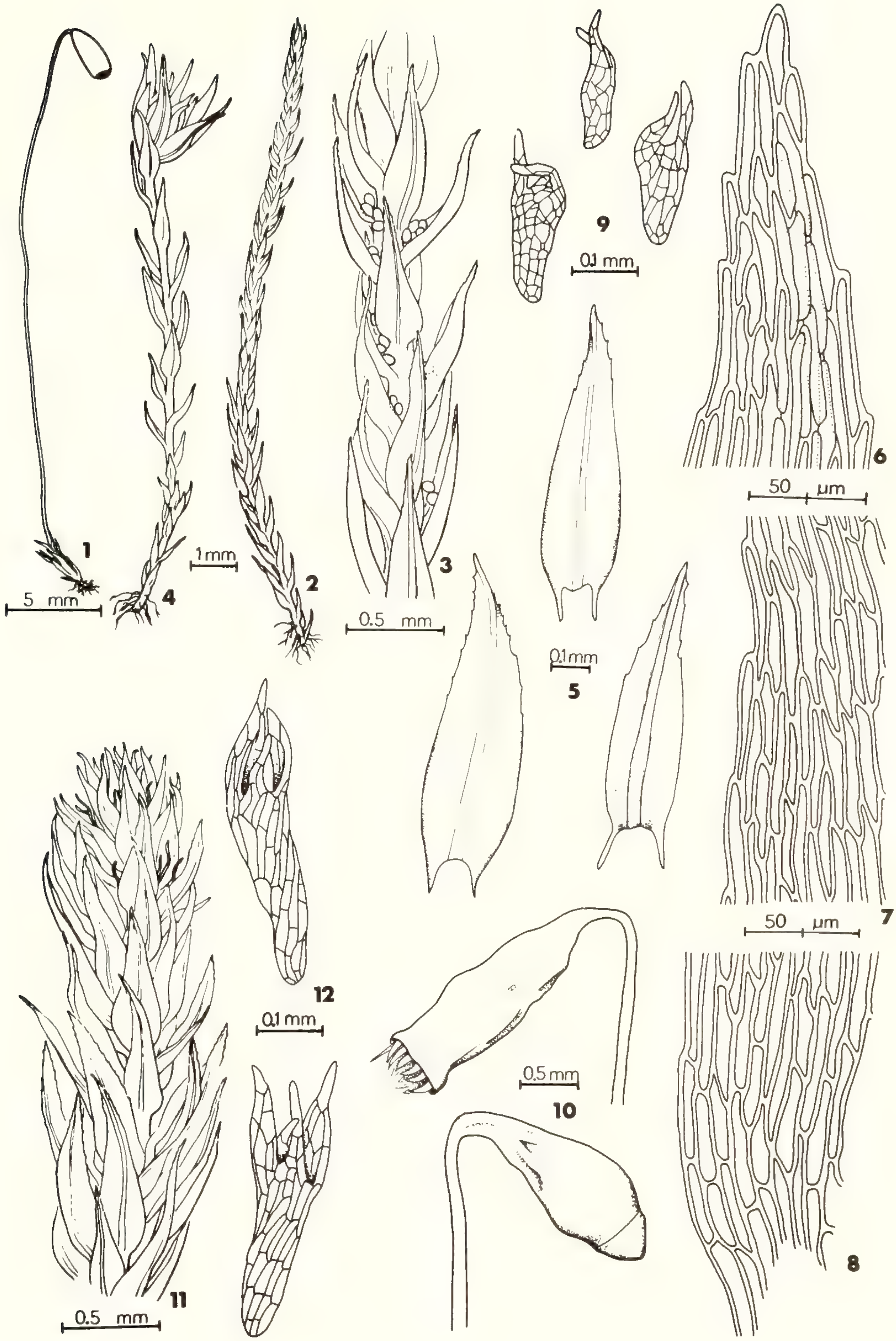
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Plate 162. 1–10. *Pohlia annotina*. 1. Habit of fruiting plant. 2. Habit of gemmiferous plant. 3. Portion of stem of gemmiferous plant. 4. Male plant. 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Gemmae. 10. Capsules (dry). 11–12. var. *decipiens*. 11. Portion of gemmiferous plant. 12. Gemmae.

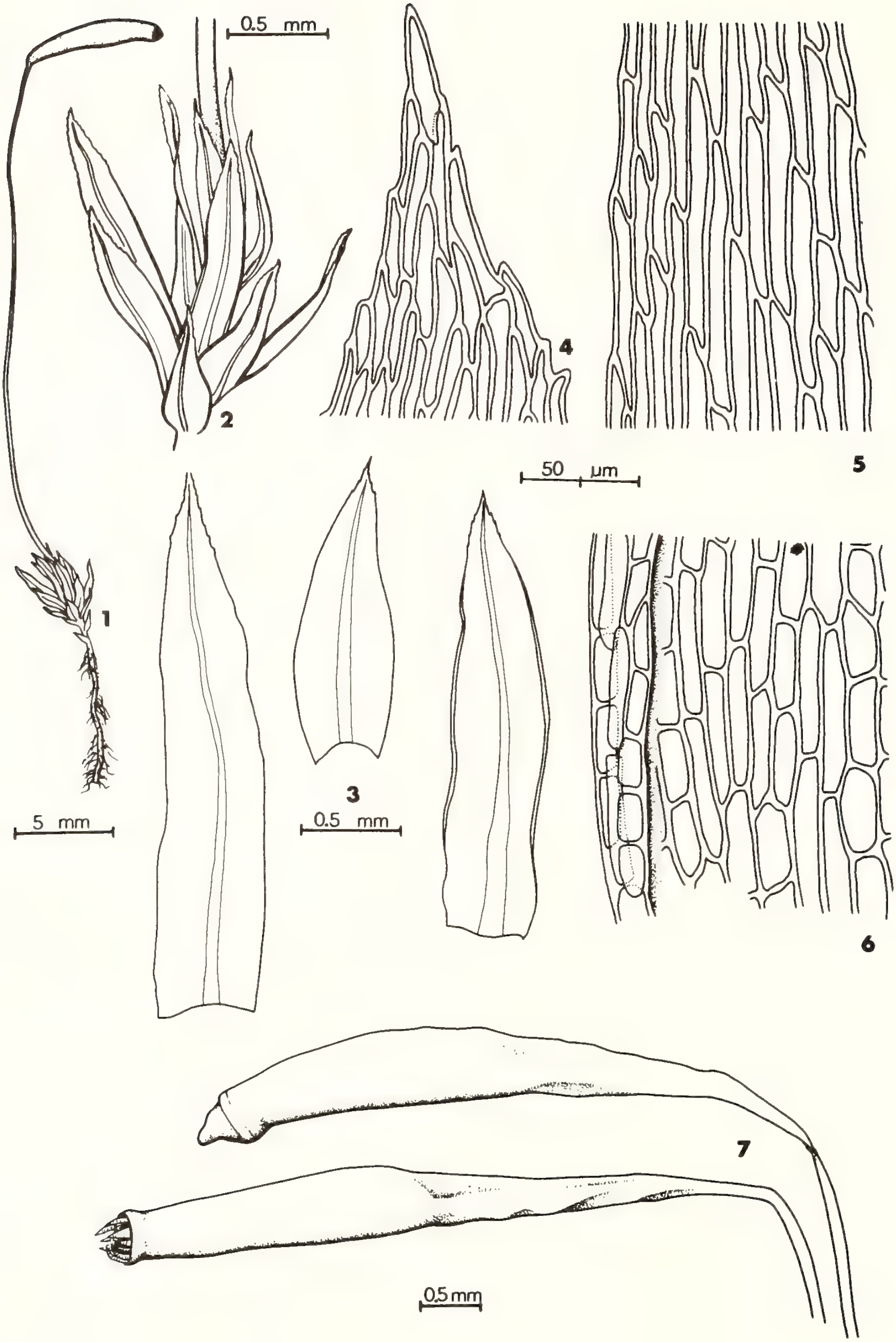
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Plate 163. *Pohlia elongata*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry).

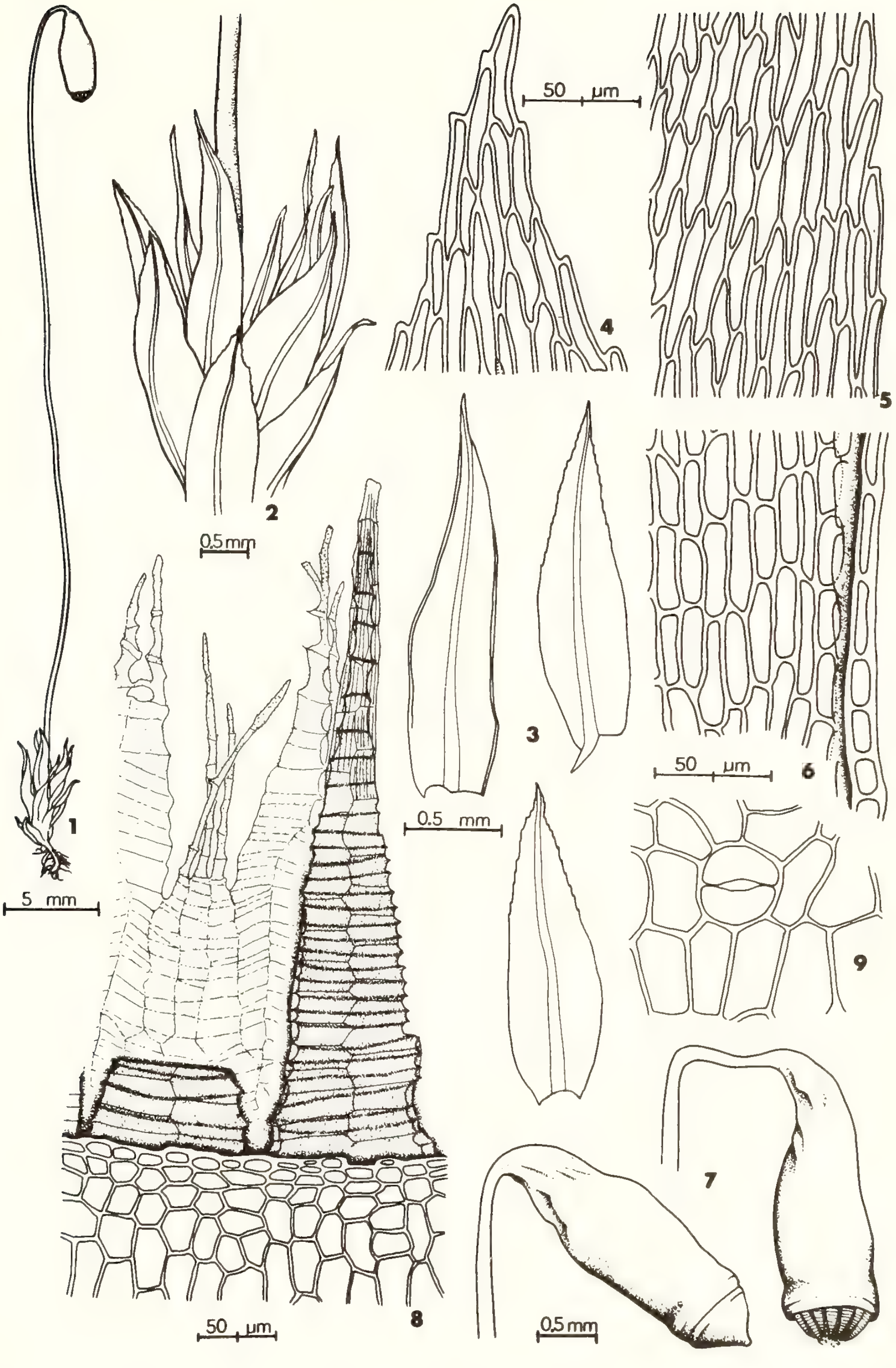
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Plate 164. *Pohlia nutans*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry). 8. Peristome teeth. 9. Stomate.

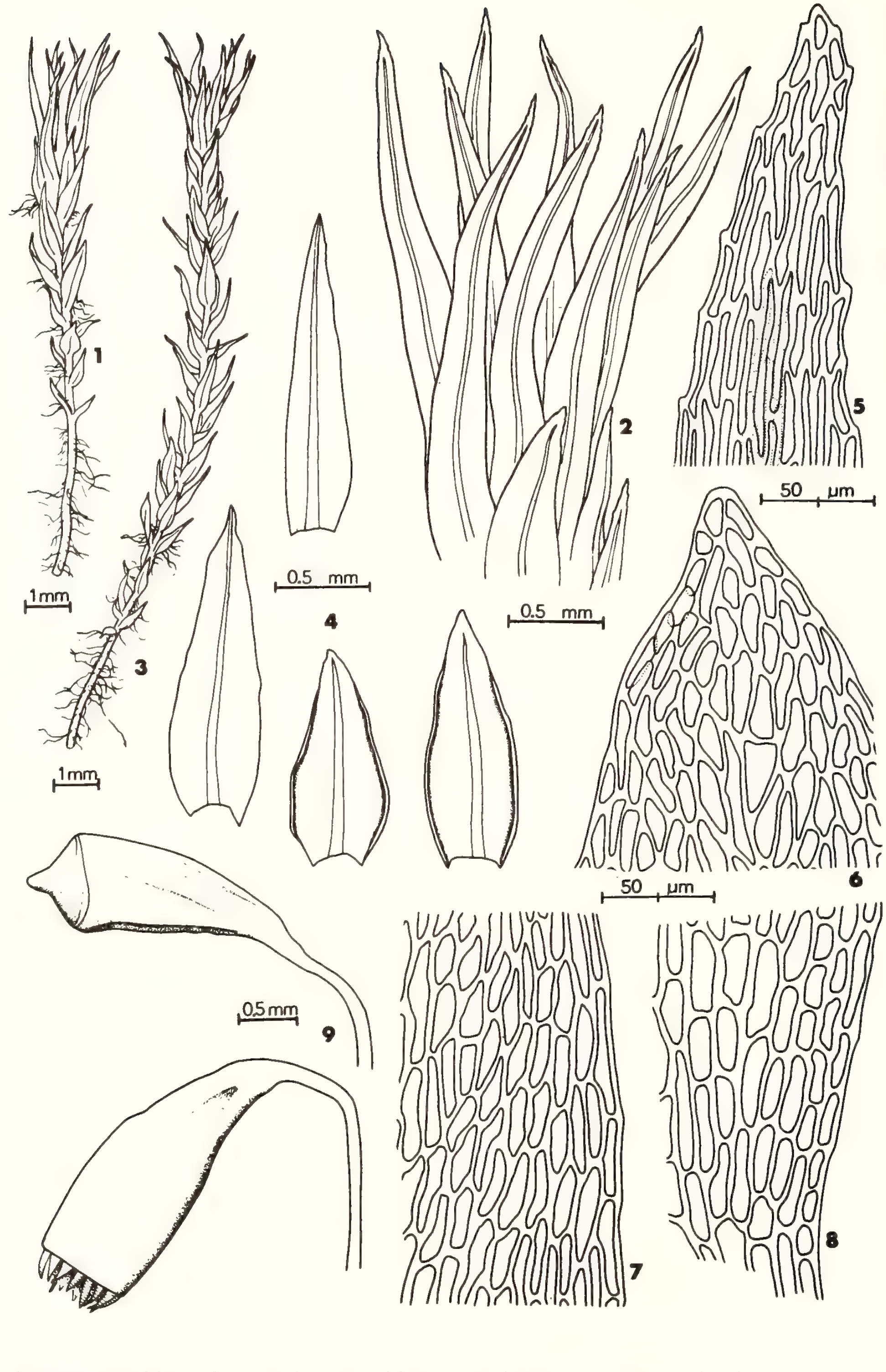
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Plate 165. *Pohlia sphagnicola*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5–6, apical. 7, median-marginal. 8, alar.). 9. Capsules (dry).

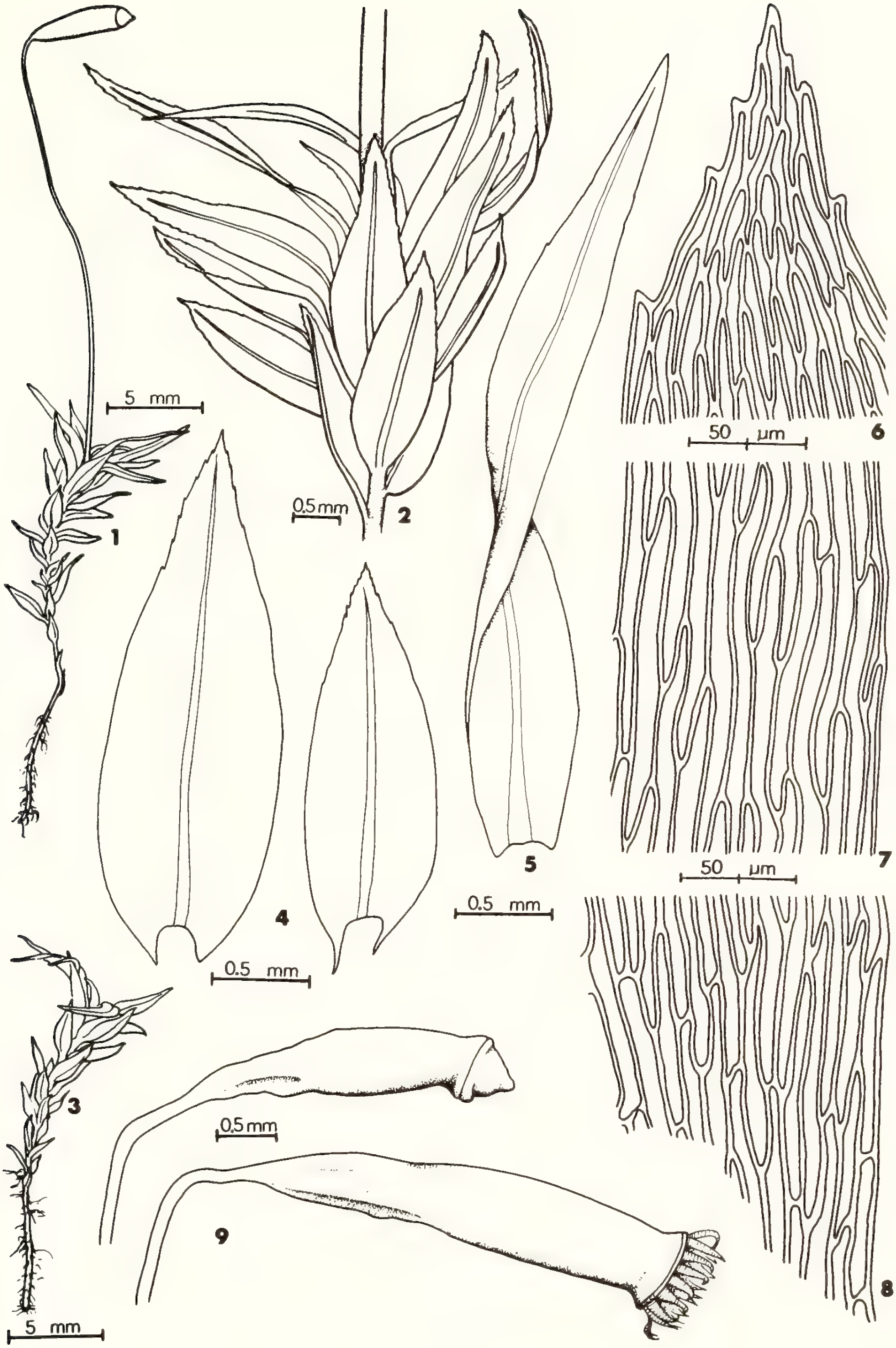
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Plate 166. *Pohlia cruda*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5. Perichaetial leaf. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Capsules (dry).

2. **Plagiobryum** Lindb., Oefv. K. Vet. Ak. Foerh. 19: 606. 1863.

Habit: In erect, loose to dense tufts.

Colour: Whitish green, the leaves mostly echlorophyllose with a pinkish tinge.

Stems: 0.5–1.5 cm high, erect, julaceous, branching by innovations, rhizoids at base.

Leaves: Imbricate, scarcely changed when dry, concave, lamina unistratose, ovate to oblong-ovate, acute, the tip reflexed, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, entire to minutely serrulate at apex.

Costae: Single, subpercurrent to shortly excurrent, scarcely prominent on dorsal surface, often reddish below.

Leaf Cells: Smooth, the walls thin, nonpitted. Median cells rhomboidal, becoming rectangular near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, reddish brown, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown to light brown, oblong-cylindric with an oblique mouth, straight to slightly arcuate, horizontal to inclined, contracted into a long neck up to twice the length of the urn, neck wrinkled when dry.

Setae: Straight, curved to hooked below capsule, smooth, not or scarcely twisted when dry, yellowish brown to light brown.

Annuli: 1–2 rows of large cells, deciduous or persistent.

Opercula: Conic

Peristomes: Double, perfect, bryaceous, exostome brown, endostome yellow, cilia 3, rudimentary.

Spores: Yellow to yellowish brown, globose to ovoid, papillose, 28–38 μm in longest dimension.

1. **Plagiobryum zierii** (Hedw.) Lindb., Oefv. K. Vet. Ak. Foerh. 19. 606. 1863.
Bryum zierii Hedw., Spec. Musc. 182. 1801.
PLATE 167

Plants erect, julaceous, in loose to dense tufts, stems 0.5–1.5 cm high; leaves echlorophyllose and whitish above, green below, with a pinkish tinge, ovate to oblong-ovate, acute, the tip reflexed, concave, 1–2 mm long, margins plane, entire to minutely serrulate at apex, costae subpercurrent to shortly excurrent, leaf cells smooth, median cells rhomboidal, 38–103 μm long; dioicous, Maritime plants not seen with sporophytes, capsules solitary, yellowish brown to light brown, oblong-cylindric, straight to slightly arcuate, mouth oblique, horizontal to inclined, neck up to twice the length of the urn, wrinkled when dry, 3–5 mm long, exserted on yellowish brown to light brown setae, 0.5–1.0 cm long, opercula conic, peristome perfect, bryaceous, with 3 rudimentary cilia.

Habitat: On wet, dripping rocks, often in the spray zone of waterfalls.

Maritime Distribution: Rare. Nova Scotia (Inverness). Known only from Big Southwest Brook *W.B. Schofield*, 21 July 1951.

Range: Greenland to Quebec, south to *Vermont, disjunct to Manitoba; occurring in the West in *Alaska, British Columbia, Yukon Territory, Alberta, Washington, and Idaho. Europe, *Asia, *Africa.

Chromosome Number: n = 10.

Remarks: Somewhat similar in appearance to *Bryum argenteum* Hedw. but plants larger and with leaves having a longer costa, a reflexed apex and a pinkish tinge. The species typically grows on or near waterfalls which contrasts with the drier type habitat of *B. argenteum*.

Sporophyte drawings from British Columbia plants.

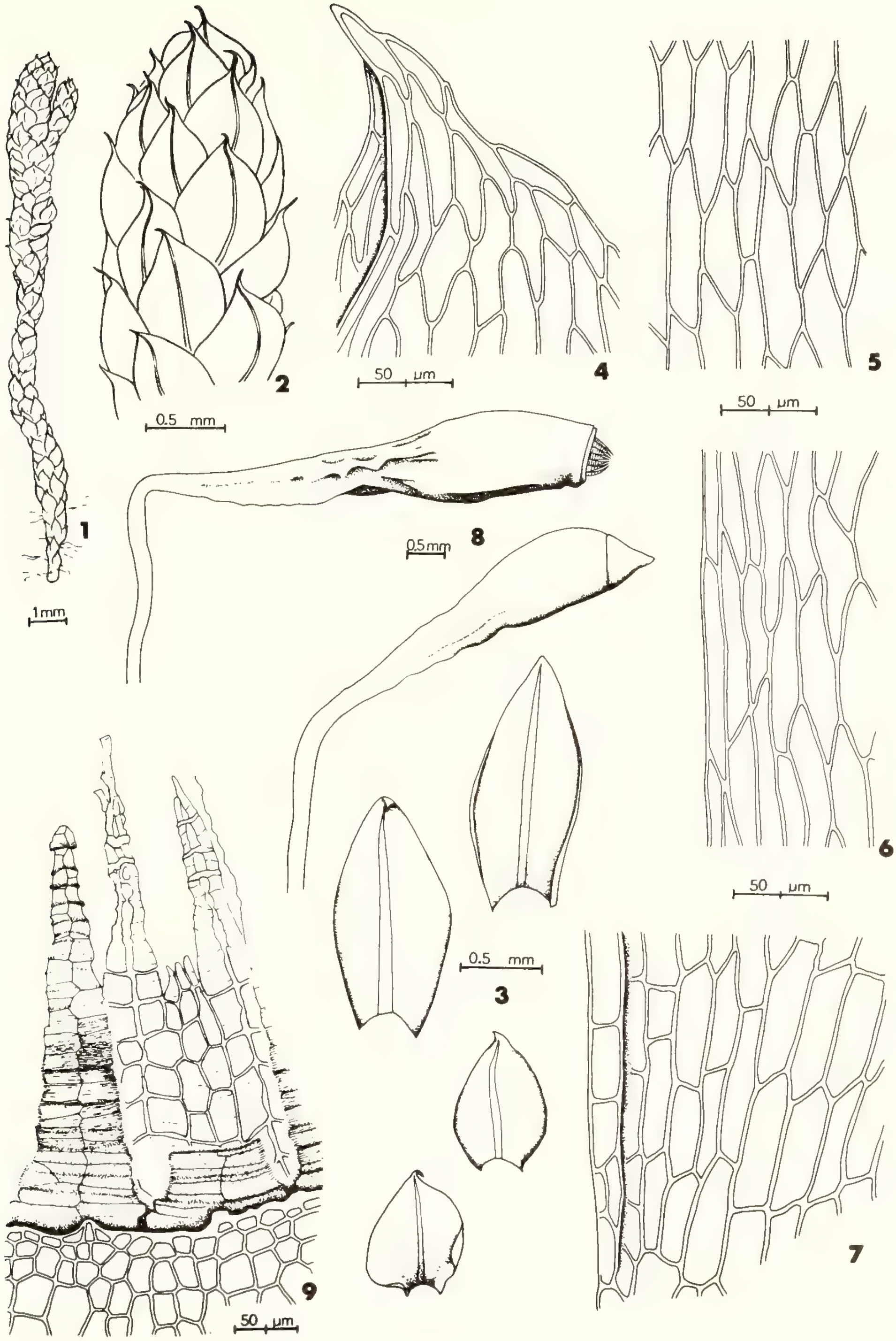
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Plate 167. *Plagiobryum zierii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Peristome teeth.

3. **Leptobryum** (B.S.G.) Wils., Bryol. Brit. 219. 1855.

Bryum subg. *Leptobryum* B.S.G., Bryol. Eur. 4: 1. 1851 (fasc. 46–47 Consp. vol. 4: III).

Habit: In erect, loose to dense tufts.

Colour: Light green to yellowish green, shiny.

Stems: 0.5–1.5 cm high, erect, simple, rhizoids at base.

Leaves: Erect-spreading to wide-spreading, flexuose, little changed when dry, somewhat concave to keeled, unistratose, 1–4 mm long, narrowly lanceolate to subulate, upper leaves with an ovate to oblong base, acute, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, entire to denticulate above, entire below.

Costae: Single, percurrent to excurrent, filling most of subula, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, nonpitted. Median cells linear to rectangular, becoming broader near base.

Asexual Reproductive Bodies: Globose to ellipsoidal, multicellular, smooth, red to orange, rhizoidal gemmae, 90–180 μm, sometimes present.

Sex: Synoicous or dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown to light brown, glossy, pyriform, straight to somewhat arcuate, inclined to pendulous, neck as long or longer than the sporangium, strongly wrinkled when dry.

Setae: Straight to flexuose, curved or hooked below capsule, smooth, not or little twisted when dry, yellowish brown to orange.

Annuli: Revoluble, deciduous, of 1–2 rows of large cells.

Opercula: Convex to short-conic and apiculate.

Peristomes: Double, perfect, bryaceous, exostome yellow, endostome with 3 appendiculate cilia.

Spores: Yellow to yellowish brown, globose, minutely papillose, 10–14 μm.

1. **Leptobryum pyriforme** (Hedw.) Wils., Bryol. Brit. 219. 1855.
Webera pyriformis Hedw., Spec. Musc. 169. 1801.
PLATE 168

Plants erect, in loose to dense tufts, stems 0.5–1.5 cm high; leaves erect-spreading to wide-spreading, flexuose, narrowly lanceolate to subulate, acute, concave to keeled, 1–4 mm long, margins plane, entire to denticulate above, entire below, costae percurrent to excurrent, leaf cells smooth, median cells linear to rectangular, 47–94 μm long; rhizoidal gemmae sometimes present, red or orange, globose to ellipsoidal; synoicous or dioicous, capsules solitary, yellowish brown to light brown, glossy, pyriform, straight to somewhat arcuate, inclined to pendulous, neck as long or longer than urn, strongly wrinkled when dry, 1.5–2.5 mm long, exserted on yellowish brown to orange setae, 1–4 cm long, opercula convex to short-conic and apiculate, peristome perfect, bryaceous.

Habitat: On soil, rock or rotten wood, often in burned-over or disturbed habitats.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Hants, Inverness, Victoria); Prince Edward Island (Kings, Queens).

Range: Throughout most of North America but more common in the North. Central and South America, Europe, Asia, *Africa, *Australia, *New Zealand.

Chromosome Number: n = 20, 21, 22.

Remarks: This species is a common inhabitant of greenhouses.

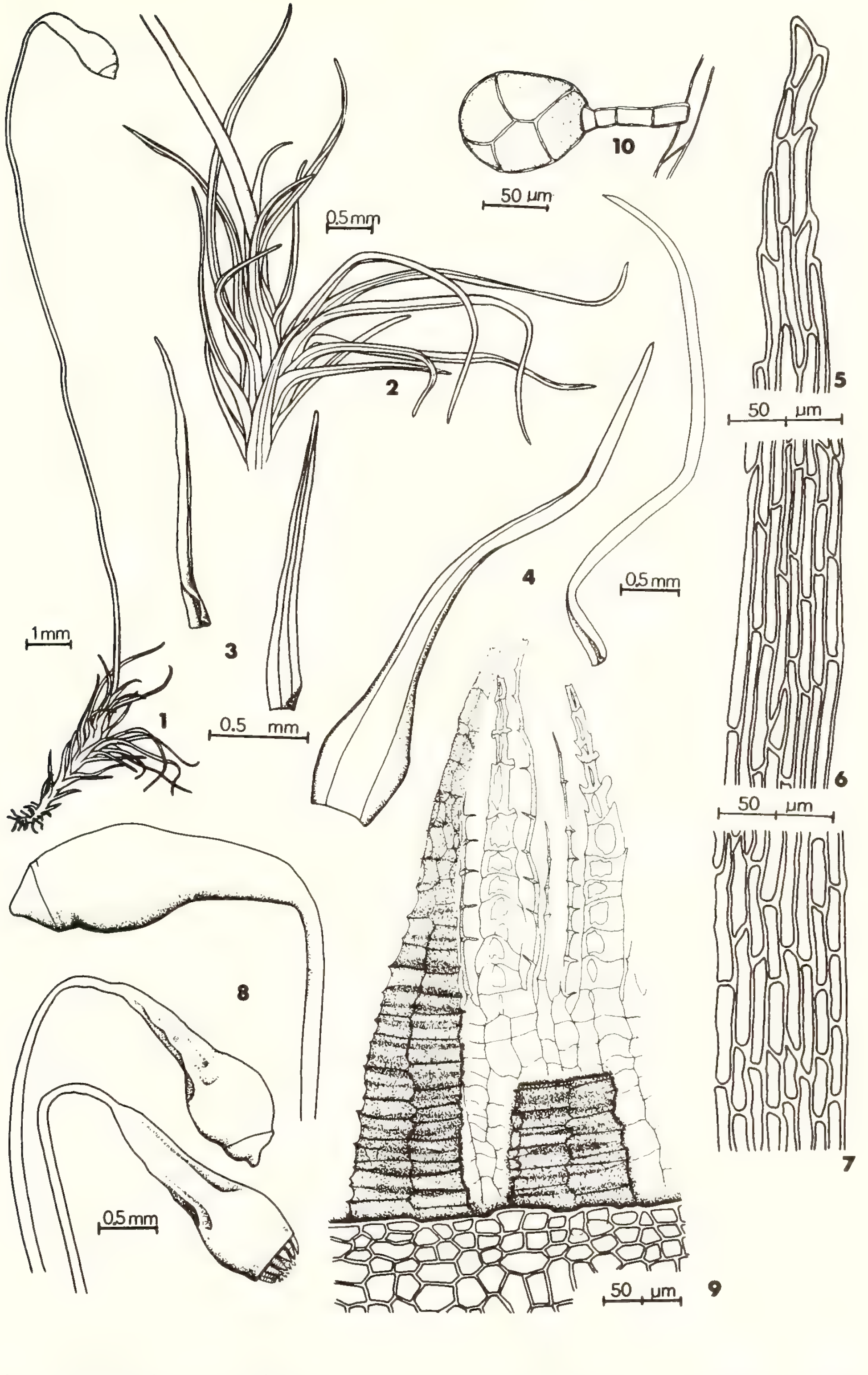
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Plate 168. *Leptobryum pyriforme*. 1. Habit. 2. Portion of stem. 3. Lower leaves. 4. Upper leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, basal.). 8. Capsules (wet one above). 9. Peristome teeth. 10. Rhizoidal gemma.

4. **Bryum** Hedw., Spec. Musc. 178. 1801.

Habit: In erect, loose to dense tufts, sometimes scattered.

Colour: Green, various shades of yellowish, brownish or reddish green, sometimes silvery-white.

Stems: 0.2–6.0 cm high, erect, forked or sometimes simple, rhizoids at base and often among leaves.

Leaves: Erect-spreading to imbricate, often twisted and contorted when dry, sometimes in rosettes, concave to weakly keeled, unistratose or bistratose on margins, ovate or obovate to ovate- or oblong-lanceolate, acute to acuminate, rarely obtuse, nondecurrent or decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or recurved to revolute often from base to near apex, denticulate to serrate at apex, sometimes entire, usually with a distinct border of narrow cells, the border sometimes bistratose.

Costae: Single, subpercurrent to long-excurrent, prominent on dorsal surface.

Leaf Cells: Smooth, the walls thin or thick on margins and near apex, pitted, sometimes to near apex. Median cells rhomboidal to hexagonal, becoming elongate, narrow and thick-walled on margins, broad and rectangular near base.

Asexual Reproductive Bodies: Lacking or present as axillary bulbils, as filiform, septate, smooth to papillose gemmae clustered in leaf axils or as globose to ovoid, multicellular, smooth gemmae on rhizoids.

Sex: Synoicous, autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown, red or reddish brown, cylindric, ovoid, pyriform, or clavate, rarely subglobose, with a short or long neck, straight to slightly arcuate, pendent, smooth, wrinkled at neck when dry.

Setae: Straight to flexuose, curved or hooked below capsule, smooth, not or little twisted when dry, brown, red or reddish brown.

Annuli: Revoluble, deciduous, of 1–3 rows of cells.

Opercula: Convex or conic.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, yellowish brown, papillose throughout, trabeculate at back, endostome hyaline, with a well-developed basal membrane $^1/_3$–$^1/_2$ height of exostome teeth, bearing 16 perforated segments alternating with exostome teeth, 1–3 cilia (rarely rudimentary or lacking) between segments, appendiculate or nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 7–34 μm in longest dimension.

1. Costae ending below apex to percurrent 2
   2. Plants silvery-white (due to absence of chlorophyll in cells) .... 16. *B. argenteum*
   2. Plants green, often with yellow, brown or red pigmentation 3
      3. Leaves obtuse to subacute 4
         4. Leaf margins recurved .... 11. *B. muehlenbeckii*
         4. Leaf margins plane 5
            5. Plants small, usually less than 1 cm high, sterile stems julaceous; sporophytes often present, red, capsules nearly as broad as long; 1 or more bulbils sometimes occurring in leaf axils .... 15. *B. blindii*
            5. Plants large, mostly 1 cm or more high, with distant, spreading leaves; clusters of septate, filiform gemmae present in leaf axils .... 6. *B. cyclophyllum*
      3. Leaves acute 6
         6. Leaves nondecurrent or sometimes shortly decurrent; clusters of brown, filiform, septate, papillose gemmae often present in leaf axils .... 17. *B. capillare*
         6. Leaves long-decurrent 7
            7. Leaf margins strongly recurved nearly to apex, unistratose .... 10. *B. pseudotriquetrum*
            7. Leaf margins plane or somewhat recurved near base, sometimes bistratose .... 5. *B. weigelii*

1. Costae percurrent to excurrent 8
  8. Plants monoicous 9
    9. Plants autoicous 10
      10. Leaves with a bistratose border of linear cells; capsules clavate or clavate-cylindric, unsymmetric . . . . 4. *B. uliginosum*
      10. Leaves with a unistratose border of linear cells; capsules elongate-ovate, symmetric . . . . 8. *B. pallescens*
    9. Plants synoicous 11
      11. Inner peristome teeth with appendiculate cilia . . . . . 7. *B. lisae* var. *cuspidatum*
      11. Inner peristome teeth with rudimentary cilia 12
        12. Leaves with a short, abruptly recurved apex; maritime plants . . . . 3. *B. salinum*
        12. Leaves with a long, straight apex; plants seldom maritime 13
          13. Capsules short, averaging less than 3 mm long; inner peristome teeth not attached to outer teeth . . . . 2. *B. stenotrichum*
          13. Capsules long, averaging about 4–5 mm long; inner peristome teeth partially attached to outer teeth . . . . 1. *B. algovicum*
  8. Plants dioicous 14
    14. Plants lacking gemmae on rhizoids . . . . 9. *B. caespiticium*
    14. Plants with globose to ovoid gemmae on rhizoids 15
      15. Gemmae yellow to orange . . . . 13. *B. tenuisetum*
      15. Gemmae brown, red or violet 16
        16. Gemmae small, usually under 140 μm in diameter . . . . . . 12. *B. violaceum*
        16. Gemmae large, usually over 140 μm in diameter . . . . 14. *B. microerythrocarpum*

1. **Bryum algovicum** Sendtn. *ex* C. Müll., Syn. 2: 569. 1851.
[Synonyms: *B. angustirete* Kindb. *ex* Mac.; *B. pendulum* (Hornsch.) Schimp.]
PLATE 169

Plants in dense tufts, light green to yellowish green, stems 0.5–1.0 cm high; leaves erect to erect-spreading, contorted when dry, ovate-lanceolate, acuminate to long-acuminate, not or slightly decurrent, 1.5–2.5 mm long, margins revolute from base to near apex, toothed near apex, unistratose, costae long-excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal, 33–75 × 12–19 μm; gemmae lacking; synoicous, setae 1–2 cm long, capsules ovoid to pyriform, 1.5–5.0 mm long, peristome teeth with endostome adhering to exostome in the lower half, exostome teeth with lamellae at back extensively joined by vertical walls giving an irregular network appearance, endostome segments widely perforated, cilia 0–2, rudimentary.

Habitat: On soil or humus, often in rock crevices.

Maritime Distribution: Rare or seldom collected. Nova Scotia (Kings, Shelburne, Victoria).

Range: Greenland to Alaska, south to New Jersey, Indiana, Illinois, Iowa, Colorado, and *Arizona. Europe, Asia, *Africa, *New Zealand.

Chromosome Number: n = 10, 27, 30.

2. **Bryum stenotrichum** C. Müll., Flora 70: 219. 1887.
[Synonyms: *B. acutiusculum* C. Müll.; *B. inclinatum* (Brid.) Bland.]
PLATE 170

Plants in dense tufts, green to yellowish green, brown below, stems 0.5–1.5 cm high; leaves erect-spreading, twisted and contorted when dry, ovate-lanceolate to oblong-lanceolate, acuminate, non-decurrent, 1.5–4.0 mm long, margins recurved to near apex, entire to denticulate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal to hexagonal, 33–66 × 14–19 μm; gemmae lacking; synoicous, setae 1–4 cm long, capsules elongate-ovoid, 2–3 (rarely 4) mm long, cilia 0–3, rudimentary.

Habitat: On soil (often sandy) or in cliff crevices.

Maritime Distribution: Frequent. New Brunswick (Victoria); Nova Scotia (Annapolis, Digby, Kings, Victoria); Prince Edward Island (Queens).

Range: Predominantly in the northern part of North America from Greenland to Alaska, south to Minnesota and *Colorado. Europe, Asia, *Africa, *Australia.

Chromosome Number: n = 10, 20, 30.

3. Bryum salinum Hag. *ex* Limpr., Laubm. Deutschl. 2: 334. 1892.
[Synonym: *B. archangelicum sensu* Andrews]
PLATE 171

Plants in dense tufts, green to yellowish green, brown or red below, stems 0.5–1.5 cm high; leaves erect-spreading with recurved apices, twisted and contorted when dry, ovate-lanceolate to oblong-lanceolate, acuminate, nondecurrent, 2–3 mm long, margins recurved to near apex, entire to denticulate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal to hexagonal, 47–66 × 14–19 μm; gemmae lacking; synoicous, setae 1–2 cm long, capsules pyriform to elongate-ovoid, 1.5–3.0 mm long, cilia 0–3, rudimentary.

Habitat: On soil in rock crevices beside the ocean.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte); Nova Scotia (Digby, Kings, Sable Island).

Range: Mainly maritime and known in North America from Greenland, Labrador, Newfoundland, Nova Scotia, New Brunswick, Quebec, *Manitoba, *British Columbia, Yukon Territory, Northwest Territories, and Alaska. Europe.

Chromosome Number: Unreported.

4. Bryum uliginosum (Brid.) B.S.G., Bryol. Eur. 4: 88. 339. 1839 (fasc. 6–9 Mon. 18. 4).
Cladodium uliginosum Brid., Bryol. Univ. 1: 841. 1827.
[Synonym: *B. cernuum* (Hedw.) B.S.G.]
PLATE 172

Plants in loose to dense tufts, green to yellowish or brownish green, often reddish on margins and costa, stems 0.5–1.5 cm high; leaves erect-spreading, twisted and contorted when dry, ovate-lanceolate to oblong-lanceolate, acuminate, nondecurrent, 2–5 mm long, margins plane, serrulate near apex, bistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal to hexagonal, 52–85 × 19–28 μm; gemmae lacking; autoicous, setae 2–4 cm long, capsules narrowly clavate or clavate-cylindric, ± curved, 4–5 mm long, cilia 2–3, rudimentary.

Habitat: On soil over calcareous rock, usually beside streams.

Maritime Distribution: Rare or seldom collected. New Brunswick (Restigouche, Victoria); Nova Scotia (Cape Breton).

Range: Labrador to *British Columbia, south to New York, Ohio, Michigan, Iowa, *Texas, New Mexico, and *Oregon. Europe, *Asia.

Chromosome Number: n = 10.

Remarks: The autoicous plants with bistratose leaf margins and long, clavate or clavate-cylindric capsules are distinctive.

5. Bryum weigelii Spreng., Mant. Prim. Fl. Halens. Add. 55. 1807.
[Synonym: *B. duvalii* Voit]
PLATE 173

Plants in loose tufts, light green to yellowish green above, brown below, stems 3–6 cm high; leaves erect-spreading, contorted when dry, ovate-lanceolate, acute to acuminate, long-decurrent, 2.5–4.0 mm long, margins plane or somewhat recurved below, entire or nearly so, sometimes bistratose, costae subpercurrent to percurrent, leaf cells elongate and narrow on margins, median cells hexagonal, 28–66 × 14–24 μm; gemmae lacking; dioicous, sporophytes unknown on Maritime plants, reported to have setae 3–6 cm long, capsules obovoid, 3.0–3.5 mm long, cilia appendiculate.

Habitat: On wet ground in roadside ditches, margins of lakes, near springs, etc.

Maritime Distribution: Frequent. New Brunswick (Restigouche); Nova Scotia (Colchester, Kings, Victoria).

Range: Greenland to Alaska, south in the eastern United States to Vermont; in the West, south to Colorado, *Utah, and California. Europe, Asia.

Chromosome Number: Unreported.

Remarks: The capsules were drawn from plants collected in western North America.

6. Bryum cyclophyllum (Schwaegr.) B.S.G., Bryol. Eur. 4: 133. 370. 1839 (fasc. 6–9 Mon. 63.10).
Mnium cyclophyllum Schwaegr., Spec. Musc. Suppl. 2(2): 160. 1827.
[Synonym: *B. tortifolium* Funck *ex* Brid.]
PLATE 174

Plants in loose tufts, green to yellowish green, stems 1–2 cm high; leaves erect-spreading, contorted when dry, ovate to oblong-ovate, obtuse, decurrent, 1.0–1.5 mm long, margins plane, entire or nearly so, unistratose, costae subpercurrent, leaf cells elongate and narrow on margins, median cells hexagonal, 33–61 × 19–24 μm; green to yellow, filiform, septate, smooth gemmae clustered in leaf axils; Maritime plants sterile, reported to be dioicous, capsules unknown in North America.

Habitat: Apparently on wet soil.

Maritime Distribution: Rare. Nova Scotia (Halifax). Known from one collection at French Village, *M.S. Brown 471*, 19 September 1928.

Range: Sporadic in North America where it is known from Newfoundland, Nova Scotia, *Quebec, *Ontario, *Alberta, *British Columbia, *Yukon Territory, *Northwest Territories, New Jersey, Arizona, Alaska, and Greenland. Europe, Asia.

Chromosome Number: n = 10.

7. Bryum lisae var. **cuspidatum** (B.S.G.) Marg., Lindbergia 1: 125. 1973.

Bryum bimum var. *cuspidatum* B.S.G., Bryol. Eur. 4: 120. 1839 (fasc. 6-9 Mon. 50).

[Synonyms: *B. creberrimum auct., non* Tayl.; *B. cuspidatum* (B.S.G.) Schimp., *non* (Hedw.) Crome]

PLATE 175

Plants in dense tufts, green to yellowish green, stems 0.5–1.0 (rarely 3) cm high; leaves erect-spreading, contorted when dry, ovate-lanceolate, acuminate, nondecurrent, 2–4 mm long, margins revolute to near apex, entire or serrate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal, 37–66 × 14–19 μm; gemmae lacking; synoicous, setae 1–4 cm long, capsules elongate-ovoid to cylindric, 2–4 mm long, cilia 2–3, appendiculate.

Habitat: On soil along roads or streams, sometimes over rock, rarely on humus in bogs.

Maritime Distribution: Common. New Brunswick (Albert, Gloucester, Kent, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Colchester, Cumberland, Hants, Inverness, Kings, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Greenland to Alaska, south to Florida, Louisiana, Colorado, Arizona, and California. Europe, *Asia, *Australia, *New Zealand.

Chromosome Number: n = 10, 22, 30.

8. Bryum pallescens Schleich. *ex* Schwaegr., Spec. Musc. Suppl. 1(2): 107. 1816.

PLATE 176

Plants in dense tufts, green to yellowish green, stems 1–3 cm high; leaves erect-spreading, spirally twisted when dry, ovate to ovate-lanceolate, acuminate, nondecurrent, 1.5–3.0 mm long, margins recurved to near apex, entire to denticulate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal to hexagonal, 33–75 × 19–24 μm; gemmae lacking; autoicous, setae 1–3 cm long, capsules elongate-ovoid to cylindric, 2–3 mm long, cilia 2–3, appendiculate to nodose.

Habitat: On soil over rock or in cliff crevices.

Maritime Distribution: Frequent. New Brunswick (Kent); Nova Scotia (Cape Breton, Kings, Queens, Victoria).

Range: Greenland to Alaska, south to Ohio, Colorado, Utah, and California. Central and *South America, Europe, Asia, *Africa.

Chromosome Number: n = 10, 11.

9. Bryum caespiticium Hedw., Spec. Musc. 180. 1801.

PLATE 177

Plants in loose to dense tufts, light green to yellowish green, stems 0.3–1.0 cm high; leaves erect-spreading and forming a rosette, contorted when dry, ovate-lanceolate, acuminate, nondecurrent, 1.5–3.0 mm long, margins revolute from base to near apex, denticulate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal, 38–71 × 9–14 μm; gemmae lacking; dioicous, setae 2–3 cm long, capsules clavate to elongate-ovoid, 2–4 mm long, cilia 3–4, appendiculate.

Habitat: On soil in clearings or in cliff crevices.

Maritime Distribution: Rare or seldom collected. New Brunswick (Kent); Nova Scotia (Victoria); Prince Edward Island (Queens).

Range: *Labrador to Alaska, south to Virginia, Tennessee, Louisiana, Nebraska, Colorado, and California. *Central and *South America, Europe, Asia, *Australia, New Zealand, *Pacific Islands.

Chromosome Number: n = 10, 11, 20, 21.

10. Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb., Fl. Wetterau 3(2): 102. 1802.

Mnium pseudotriquetrum Hedw., Spec. Musc. 190. 1801.

[Synonym: *B. bimum* (Brid.) Turn.]

PLATE 178

Plants in dense tufts, green or sometimes brownish or reddish, stems red, 2–6 cm high; leaves erect-spreading, twisted and contorted when dry, ovate-lanceolate to oblong-lanceolate, acute to acuminate, long-decurrent, 2.5–4.0 mm long, margins recurved to near apex, entire or serrulate near apex, unistratose, costae percurrent to short-excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal to hexagonal, 24–56 × 14 - 19 μm; gemmae lacking; dioicous or synoicous, setae 2–4 cm long, capsules elongate-ovoid to cylindric, 3–5 mm long, cilia 2–4, appendiculate.

Habitat: On wet, often sandy soil or humus beside roads, streams or lakes, sometimes on wet boulders and rock ledges that are frequently calcareous, and occasionally on decayed wood in swamps.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Madawaska, Queen's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria, Yarmouth, Sable Island).

Range: Greenland to Alaska, south to North Carolina, Alabama, Arkansas, Oklahoma, Colorado, and California. *Central and South America, Europe, Asia, *Australia.

Chromosome Number: n = 10, 11, 12, 20, 22.

Remarks: A distinct *Bryum* with red stems and long-decurrent leaves. Crum (1976) reports filamentous, brown brood-bodies on the stems but none were seen on the Maritime plants.

11. **Bryum muehlenbeckii** B.S.G., Bryol. Eur. 4: 163. 381. 1846 (fasc. 32 Mon. Suppl. 1: 11. 13). [Synonym: *B. rauei* Aust.]
PLATE 179

Plants in dense tufts, dark green to reddish or brownish green, stems 1-3 cm high; leaves imbricate to slightly spreading, scarcely changed when dry, oblong-ovate to ovate-lanceolate, obtuse to subacute, rarely acute, nondecurrent, 1.0–2.5 mm long, margins recurved to leaf middle or above, entire to denticulate near apex, unistratose, costae red, ending below apex to percurrent, leaf cells slightly longer, narrower and thicker walled on the margins, median cells rhomboidal to hexagonal, 38–66 × 9–19 μm; gemmae lacking; dioicous, setae 1–2 cm long, capsules ovoid-cylindric, 1.5–2.0 mm long, cilia 1–2, nodose to appendiculate.

Habitat: On rock, often in or beside streams and lakes.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Inverness).

Range: Known in eastern North America from Newfoundland, Nova Scotia, Quebec, Ontario, and New York; in western North America from Alberta, *British Columbia, Idaho, Nevada, Montana, Washington, Oregon, New Mexico, and California; also in Oklahoma (?). Europe, *Asia, *Africa.

Chromosome Number: Unreported.

Remarks: Lawton (1971) reports that the plants in eastern North America are "somewhat different from collections from western North America and are doubtfully this species."

12. **Bryum violaceum** Crundw. & Nyh., Bot. Not. 116: 94. 1963.
PLATE 180

Plants in loose to dense tufts, green to brownish or reddish green, stems 0.3–0.7 cm high; leaves erect-spreading, scarcely changed when dry, ovate-lanceolate to oblong-lanceolate, acuminate, nondecurrent, 1.0–1.5 mm long, margins plane or recurved below, denticulate to serrulate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal, 47–75 × 9–19 μm; red or violet, globose to ovoid, multicellular, smooth gemmae on rhizoids, 80–140 μm in diameter; dioicous, setae 0.7–1.5 cm long, capsules ovoid-cylindric, 1.5–2.5 mm long, cilia 2–3, appendiculate.

Habitat: On wet soil beside ocean.

Maritime Distribution: Rare. Nova Scotia (Kings). Collected once 3.2 km north of Scots Bay, 16 July 1974 (*Ireland 17479*).

Range: Sporadic across North America, occurring in Nova Scotia, Quebec, *Ontario, *British Columbia, *Wisconsin, *Iowa, *Nebraska, *Idaho, Washington, and *California. *South America, *Europe.

Chromosome Number: Unreported.

Remarks: Crundwell and Nyholm (1964) clarified the taxonomy and distribution of this species and others with rhizoid gemmae, including *B. microerythrocarpum* and *B. tenuisetum* which also occur in the Maritimes.

13. **Bryum tenuisetum** Limpr., Jahresber. Schles. Ges. Vaterl. Kult. 74(2): 4. 1897.
PLATE 181

Plants in loose tufts, green to brownish or reddish green, stems 0.2–0.6 cm high; leaves erect-spreading, scarcely changed when dry, ovate-lanceolate to oblong-lanceolate, acuminate, nondecurrent, 1–2 mm long, margins plane or recurved to near apex, denticulate to serrulate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal, 33–66 × 9–14 μm; yellow to orange, globose, multicellular, smooth gemmae on rhizoids, 110–170 μm in diameter; dioicous, setae 1–2 cm long, capsules ovoid-cylindric, 1–2 (rarely 3) mm long, cilia 2–3, appendiculate.

Habitat: On clay soil of roadside banks and clearings in woods.

Maritime Distribution: Frequent. New Brunswick (Carleton, Charlotte, Restigouche, York); Nova Scotia (Victoria).

Range: Sporadic in North America where it is known from Nova Scotia, New Brunswick, *Quebec, *British Columbia, *Washington, and *California. Europe.

Chromosome Number: Unreported.

Remarks: See *B. violaceum*.

14. Bryum microerythrocarpum C. Müll. & Kindb. *ex* Mac. & Kindb., Cat. Canad. Pl. 6: 124. 1892.

PLATE 182

Plants scattered to gregarious, green to brownish green, stems 0.3–0.8 cm high; leaves erect-spreading, scarcely changed when dry, ovate-lanceolate to oblong-lanceolate, acuminate, nondecurrent, 1–2 mm long, margins plane or recurved below, denticulate near apex, unistratose, costae excurrent, leaf cells elongate, narrow, thick-walled on margins, median cells rhomboidal, 33–70 × 9–14 μm; red, globose, multicellular, smooth gemmae on rhizoids, 140–235 μm in diameter; dioicous, setae 0.6–2.0 cm long, capsules ovoid-cylindric, 1.5–2.5 mm long, cilia 2–3, appendiculate.

Habitat: On soil along roadsides.

Maritime Distribution: Rare. New Brunswick (Madawaska); Nova Scotia (Digby).

Range: Sporadic. Known from New Brunswick, Nova Scotia, British Columbia, and *Washington. Europe, *New Zealand.

Chromosome Number: Unreported.

Remarks: See *B. violaceum*.

15. Bryum blindii B.S.G., Bryol. Eur. 4: 163. 383. 1846 (fasc. 32 Mon. Suppl. 1: 11. 12).

PLATE 183

Plants often julaceous, in loose to dense tufts, yellowish green, stems 0.3–1.0 cm high; leaves erect, imbricate on sterile stems, erect-spreading and forming a rosette on fertile stems, somewhat contorted when dry, ovate to oblong-ovate, obtuse to subacute, nondecurrent, 0.8–1.5 mm long, margins plane, entire or denticulate near apex, unistratose, costae subpercurrent to shortly excurrent, leaf cells slightly narrower on margins, median cells rhomboidal, 38–80 × 9–14 μm; 1 or more axillary bulbils sometimes present, yellowish green with a reddish base; dioicous, setae 1–2 cm long, capsules ovoid to subglobose, 1–2 mm long, cilia 2–3, appendiculate.

Habitat: On calcareous sandstone bluff beside ocean.

Maritime Distribution: Rare. New Brunswick (Restigouche). Known only from Jacquet River, 10 August 1970 (*Ireland 14324, 14329*).

Range: Sporadic in North America where it is known from New Brunswick, Ontario, Manitoba, *Alberta, British Columbia, *Yukon Territory, and *Alaska. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: Possible to confuse with *Pohlia filiformis* but the rosette-like fertile stems and the distinctive red, subglobose capsules are an easy means of recognizing *B. blindii*. Axillary bulbils, somewhat like those of *Pohlia andalusica*, sometimes occur on *B. blindii* but are lacking on *P. filiformis*.

16. Bryum argenteum Hedw., Spec. Musc. 181. 1801.

PLATE 184

Plants julaceous, in loose to dense tufts, silvery-white, stems 0.4–1.0 cm high; leaves erect, imbricate, unchanged when dry, ovate, apiculate to filiform-acuminate, apex usually somewhat recurved, nondecurrent, 0.5–1.0 mm long, margins plane or somewhat recurved below, entire, unistratose, costae subpercurrent, leaf cells not differentiated on margins, median cells rhomboidal, 38–75 × 9–14 μm; gemmae lacking; dioicous, setae 0.8–2.0 cm long, capsules oblong-cylindric, 1–2 mm long, cilia 2–3, appendiculate.

Habitat: On soil, often in disturbed habitats, along roads, trails, etc.

Maritime Distribution: Frequent. New Brunswick (Carleton, Kent, Victoria); Nova Scotia (Digby, Halifax, Kings, Lunenburg); Prince Edward Island (Kings, Queens).

Range: Cosmopolitan.

Chromosome Number: n = 10, 11, 12, 13, 20.

Remarks: This weedy species has survived human disturbance and pollution in cities where it frequently grows in cracks of sidewalks, on concrete bridges, brick walls, etc. The silvery-white colour is due to the lack of chlorophyll in most of the upper leaf cells.

17. Bryum capillare Hedw., Spec. Musc. 182. 1801.

PLATE 185

Plants in loose to dense tufts, dark green to brownish green, stems 0.3–1.0 cm high; leaves erect-spreading, spirally twisted when dry, ovate to obovate, cuspidate to acuminate, nondecurrent or shortly decurrent, 1–3 mm long, margins plane or recurved nearly to apex, entire or denticulate near apex, unistratose, costae subpercurrent or rarely percurrent, leaf cells elongate, narrow, thick-walled on margins, median cells hexagonal, 38–56 × 19–33 μm; brown, filiform, septate, papillose gemmae clustered in leaf axils; dioicous, setae 1.5–2.5 cm long, capsules clavate to elongate-ovoid, 2.5–3.5 mm long, cilia 1–4, appendiculate.

Habitat: On soil, humus over rock (sometimes limestone), or on bases of trees.

Maritime Distribution: Frequent. New Brunswick (Charlotte, Restigouche, Victoria, York); Nova Scotia (Inverness, Lunenburg, Pictou, Queens, Victoria).

Range: Labrador to British Columbia, south to Florida, Louisiana, New Mexico, Arizona, and California. Central and *South America, West Indies, Europe, Asia, *Australia, *New Zealand, Pacific Islands.

Chromosome Number: n = 10, 11, 12, 20.

Remarks: This is one species of *Bryum* that is usually sterile but easy to recognize because of the cuspidate leaves with the costae ending far below the apex and the clusters of brown, filiform, septate, papillose propagula in the leaf axils.

Syed (1973) made a study of *Bryum capillare* and related species. Most of the Maritime collections could be referred to *B. flaccidum* Brid. which has been regarded by most bryologists as a variety of *B. capillare*. I believe that further studies are required before this name can be applied to the Maritime plants.

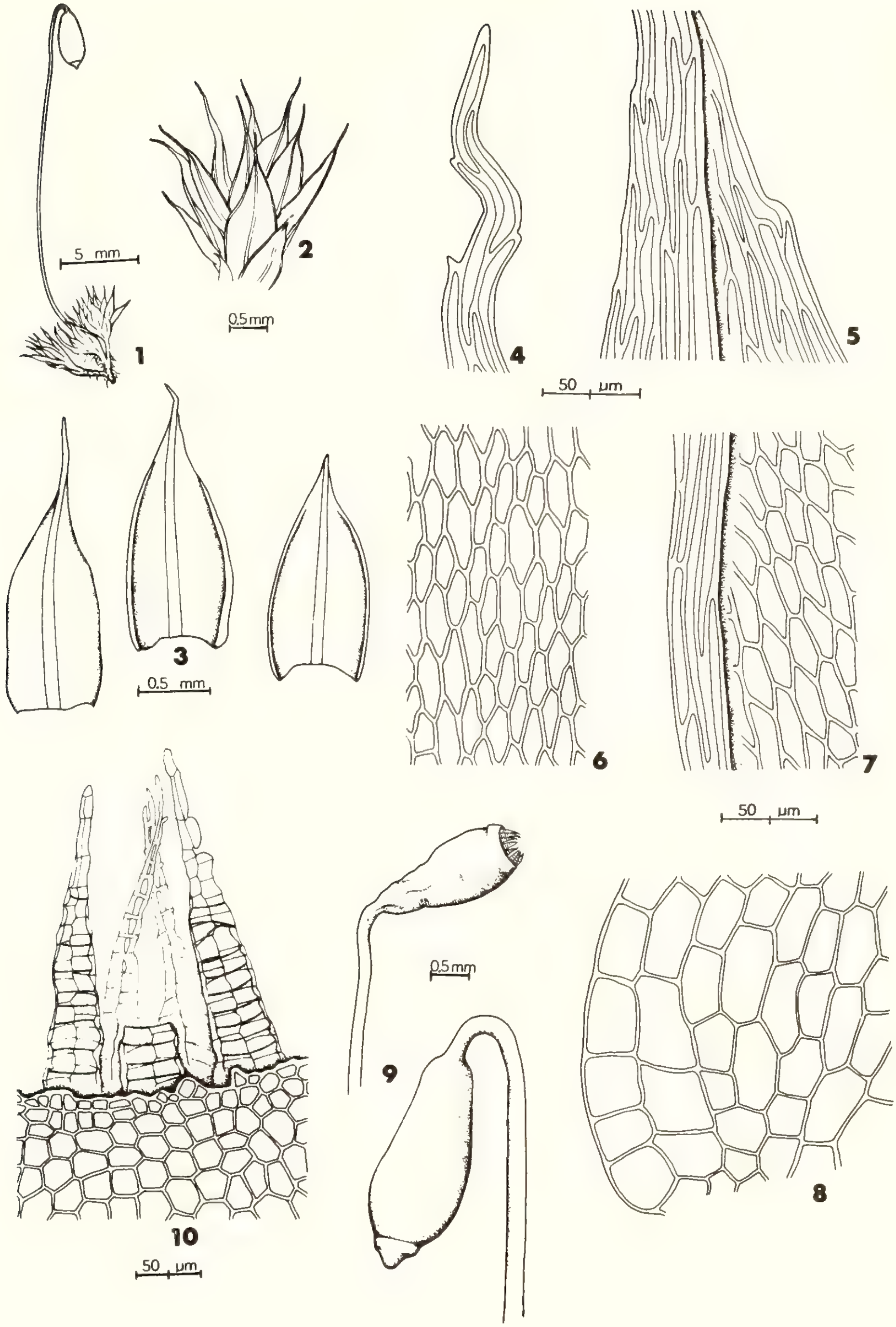
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Plate 169. *Bryum algovicum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–8. Leaf cells (4–5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

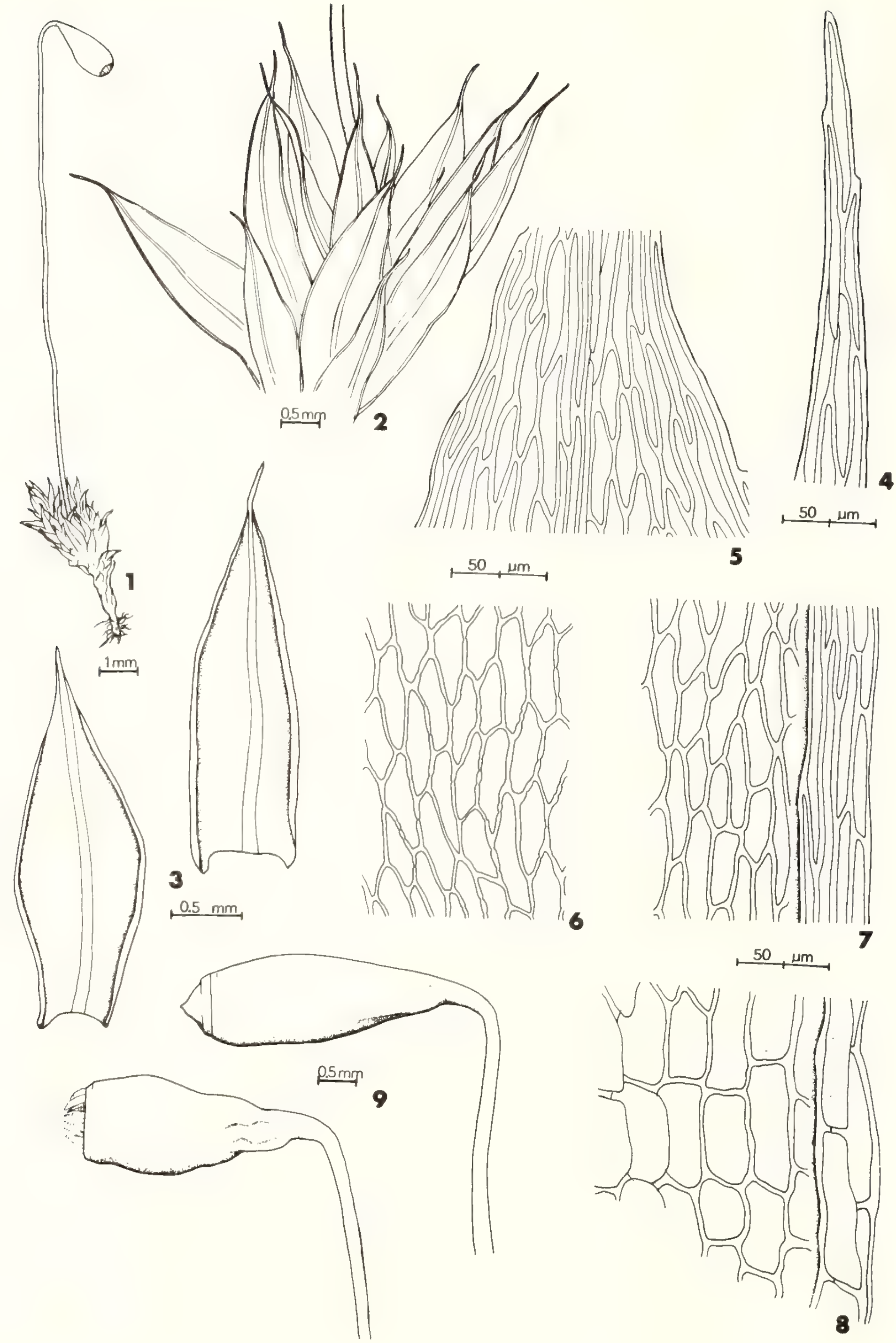
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Plate 170. *Bryum stenotrichum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–8. Leaf cells (4–5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules (dry).

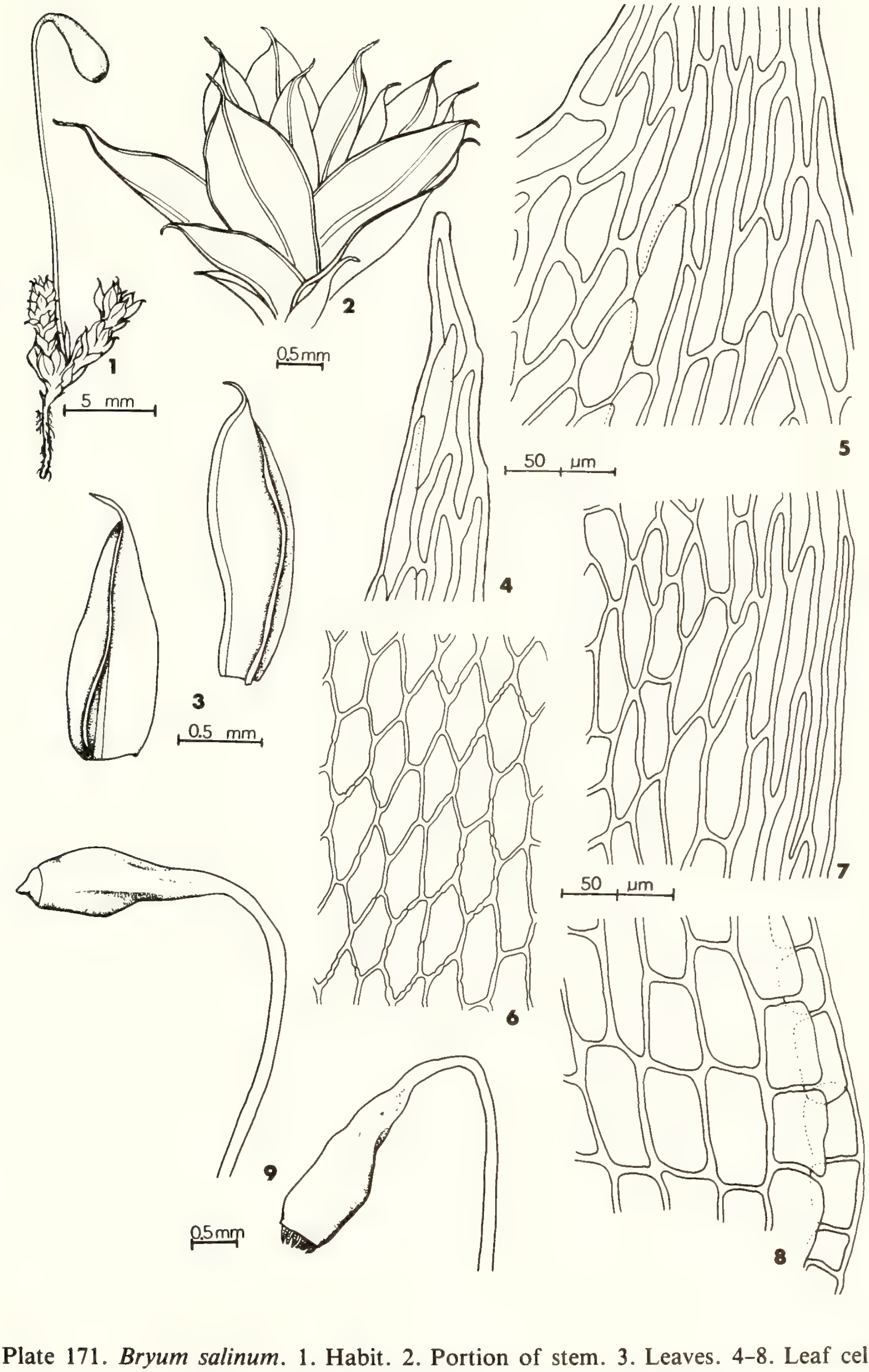
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Plate 171. *Bryum salinum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–8. Leaf cells (4–5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules (dry).

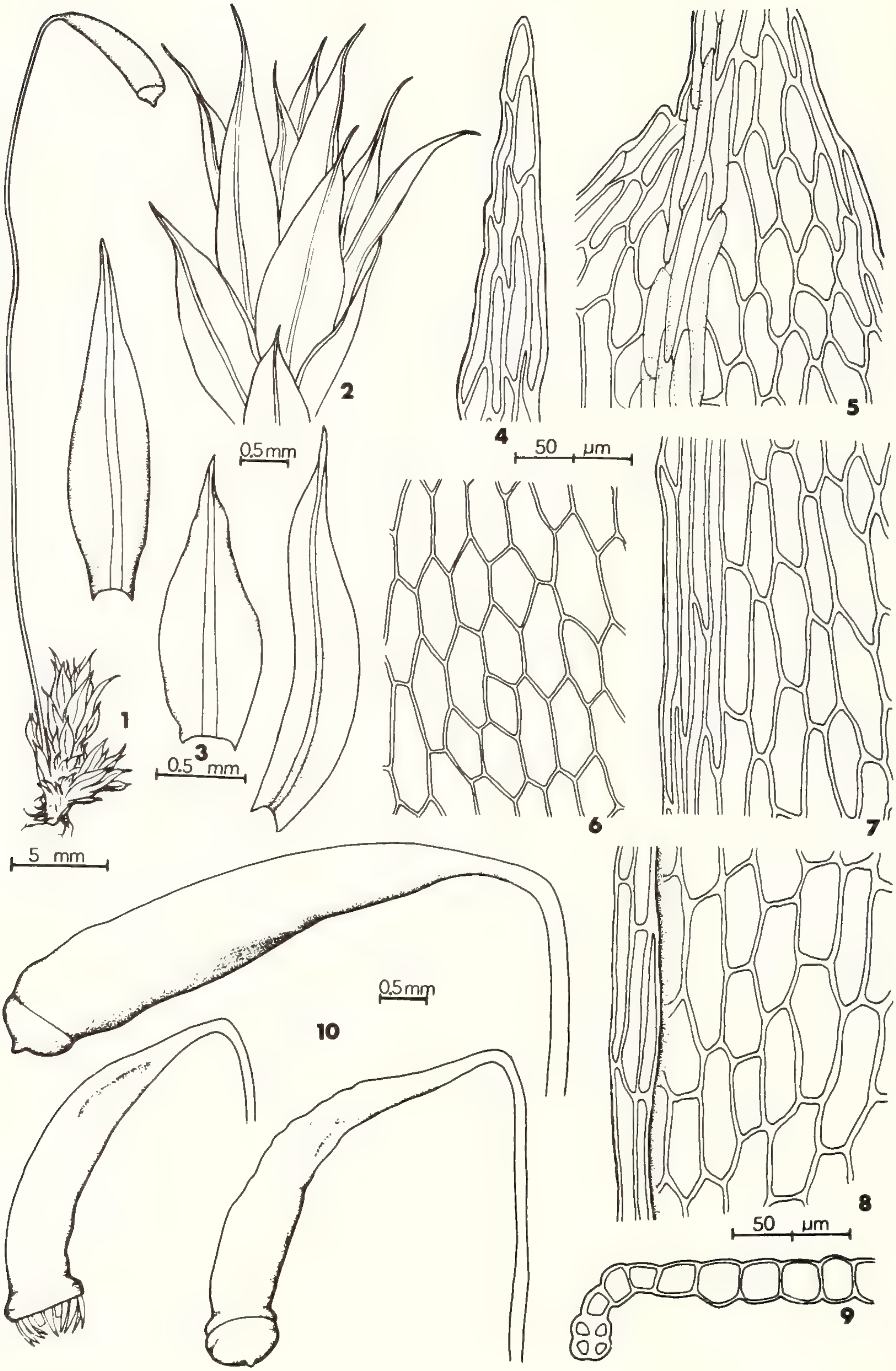
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Plate 172. *Bryum uliginosum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–8. Leaf cells (4–5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of marginal cells below middle. 10. Capsules (wet above).

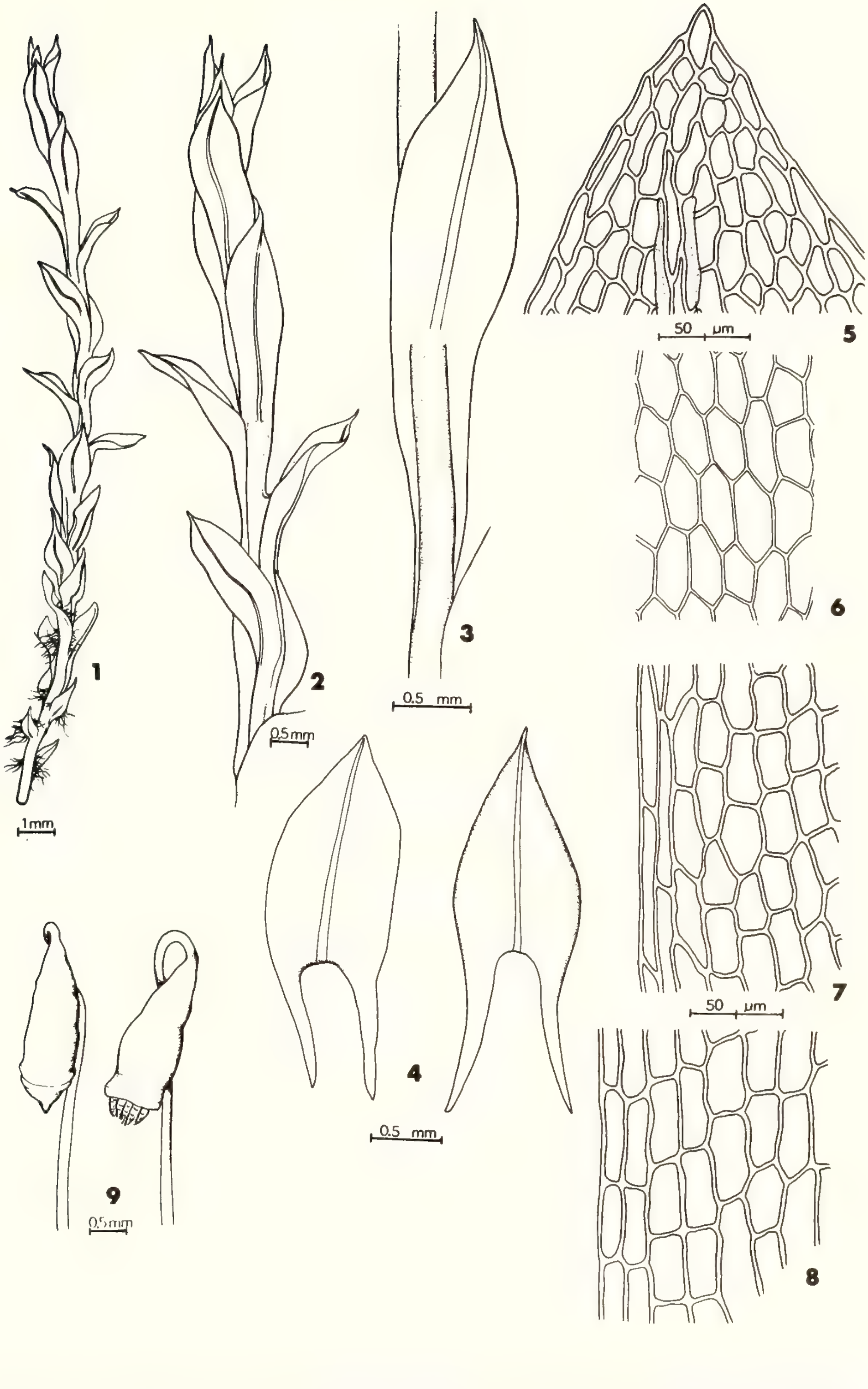
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Plate 173. *Bryum weigelii*. 1. Habit. 2. Portion of stem. 3. Portion of stem showing long-decurrent leaf. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules (dry).

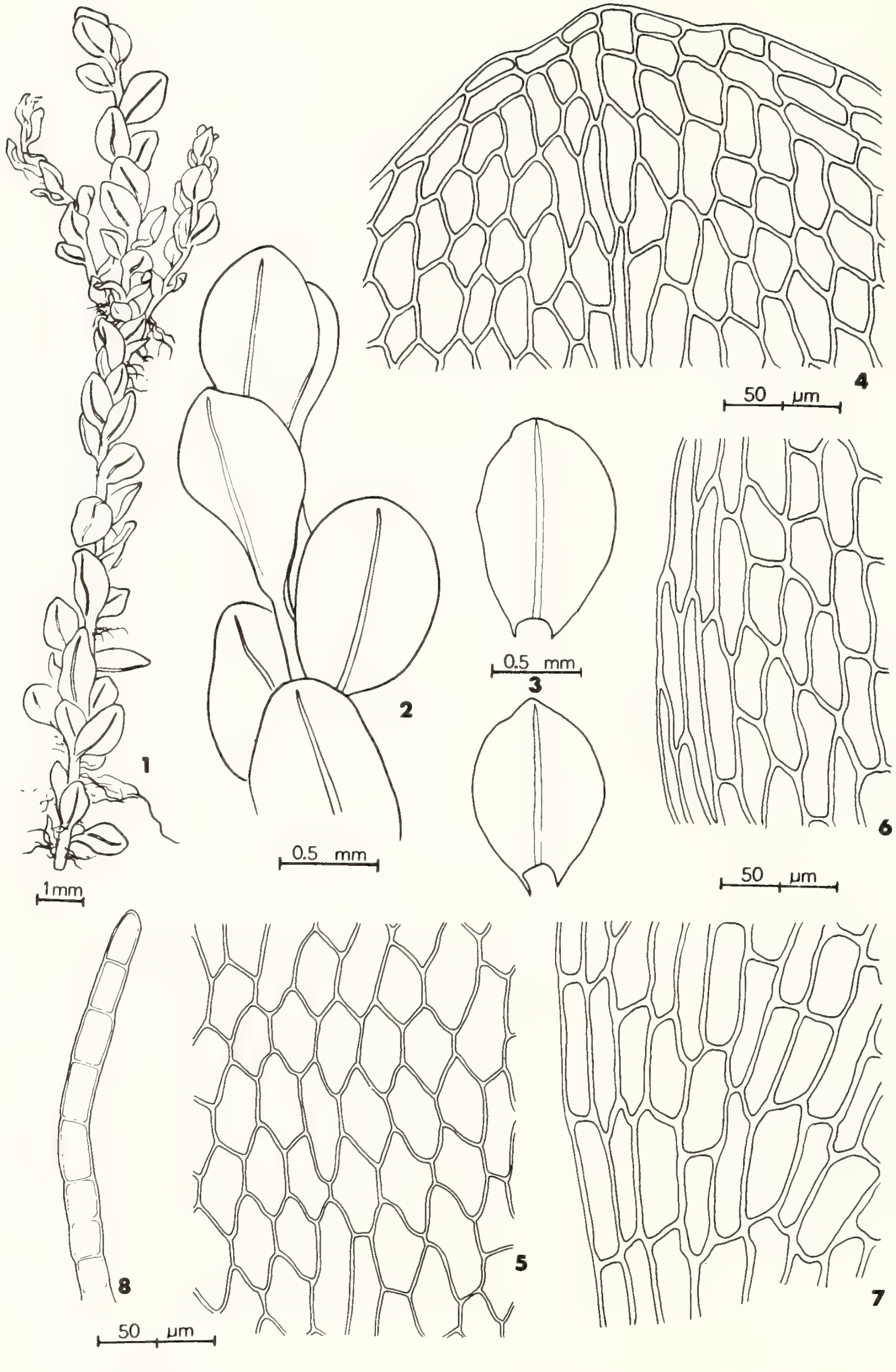

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Plate 174. *Bryum cyclophyllum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Apical portion of gemma.

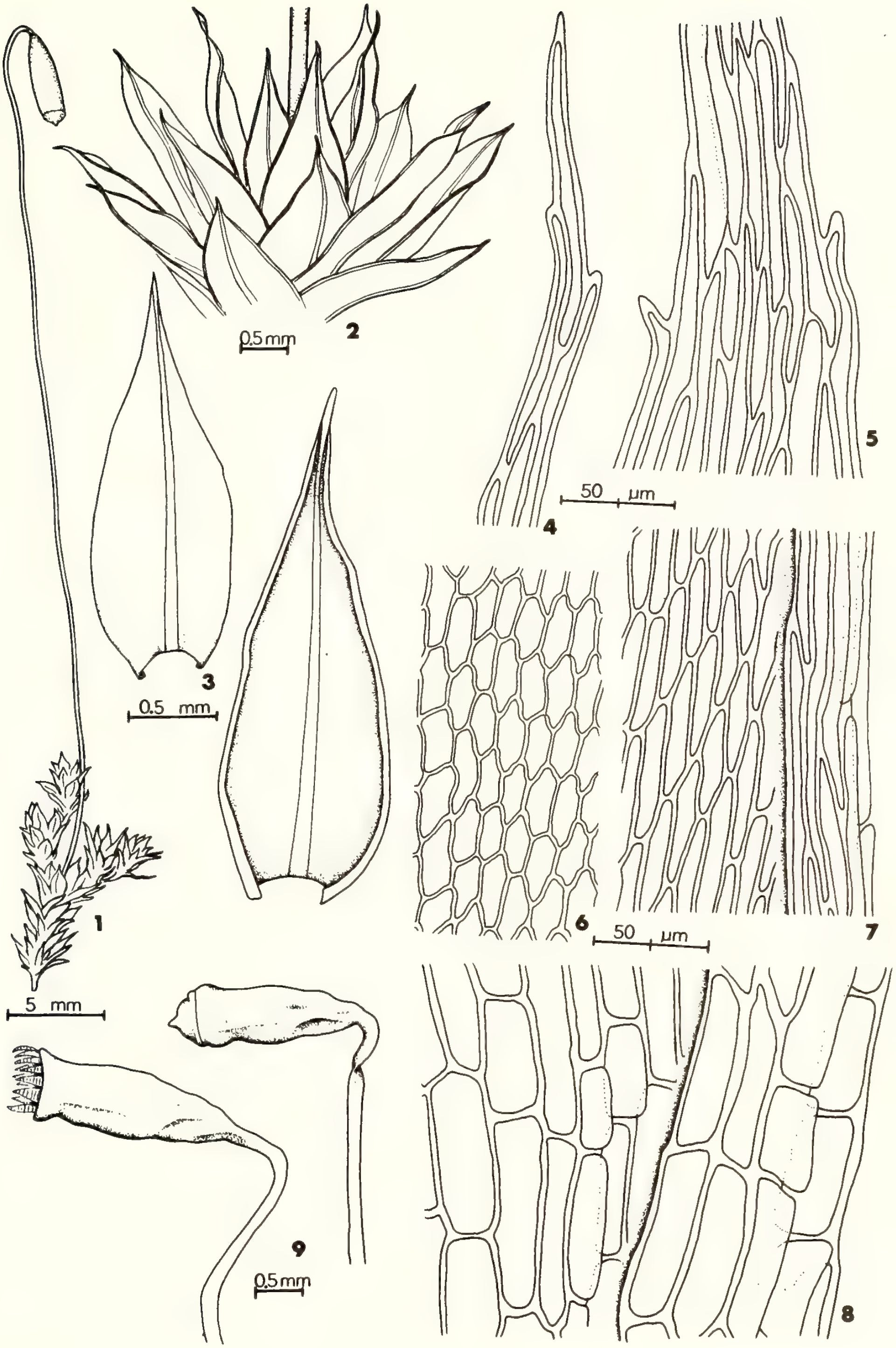
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Plate 175. *Bryum lisae* var. *cuspidatum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–8. Leaf cells (4–5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules (dry).

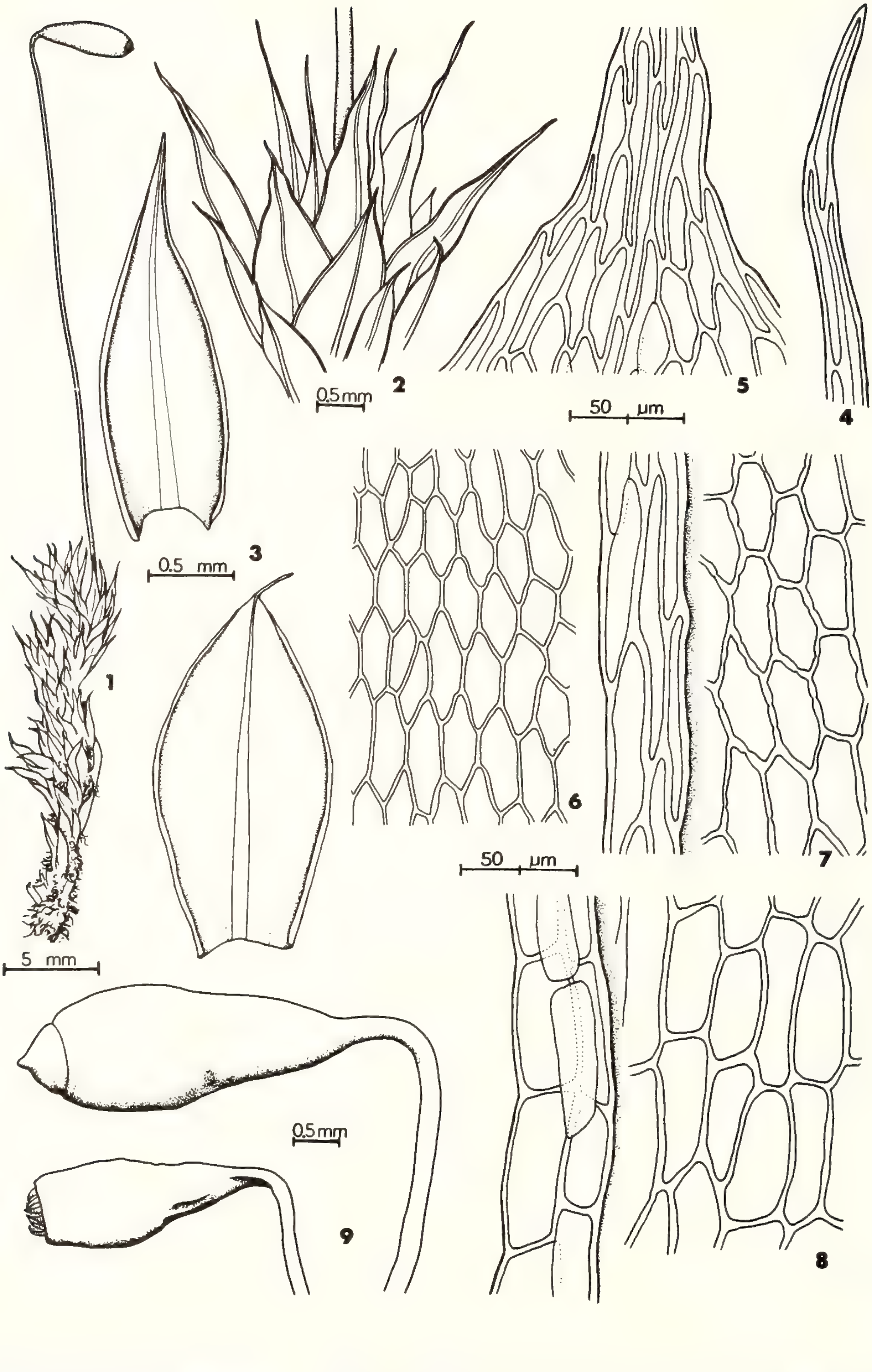
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Plate 176. *Bryum pallescens*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–8. Leaf cells (4–5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

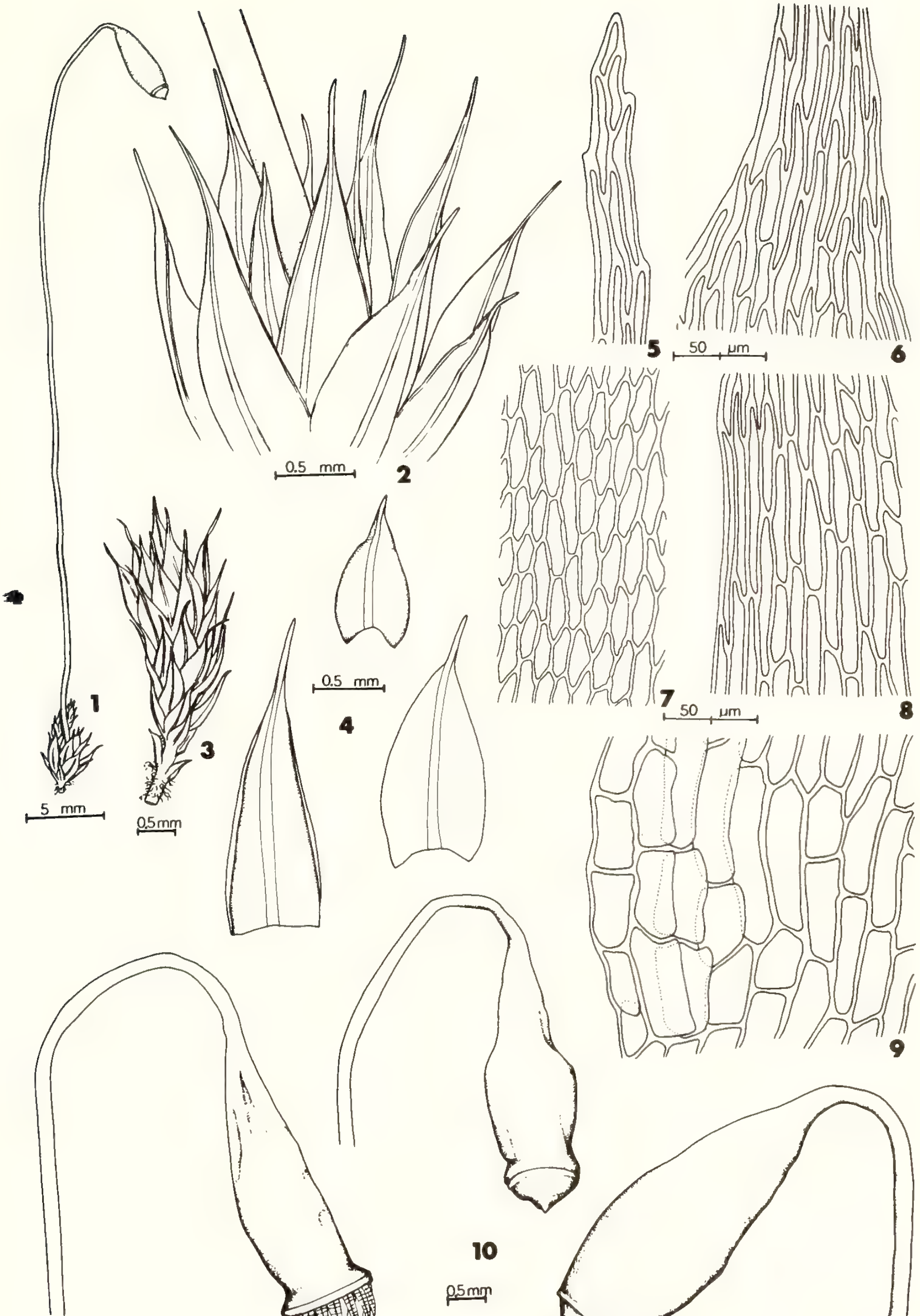
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Plate 177. *Bryum caespiticium*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–9. Leaf cells (5–6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Capsules (wet on right).

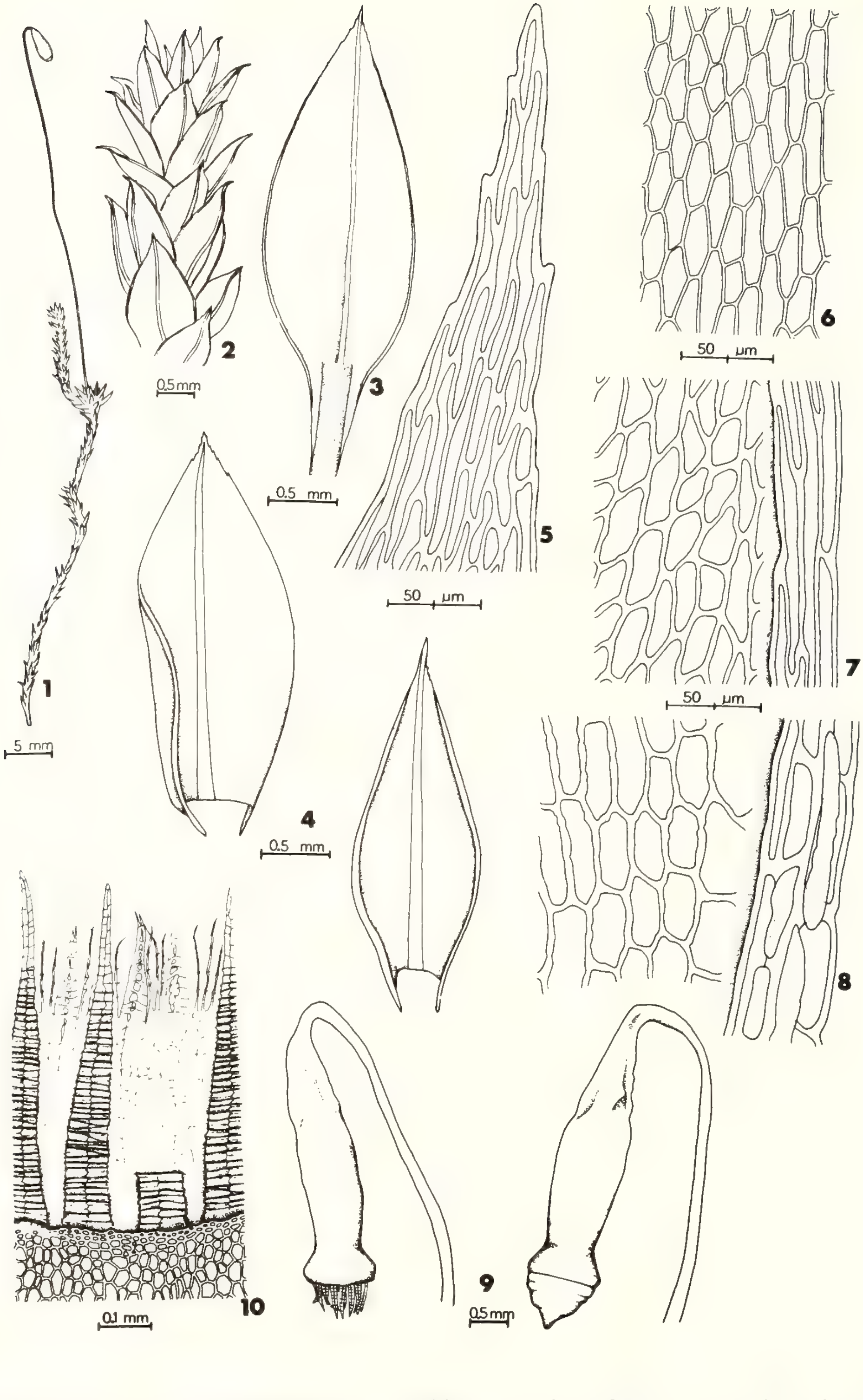
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Plate 178. *Bryum pseudotriquetrum*. 1. Habit. 2. Portion of stem. 3. Portion of stem showing long-decurrent leaf. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules (dry). 10. Peristome teeth.

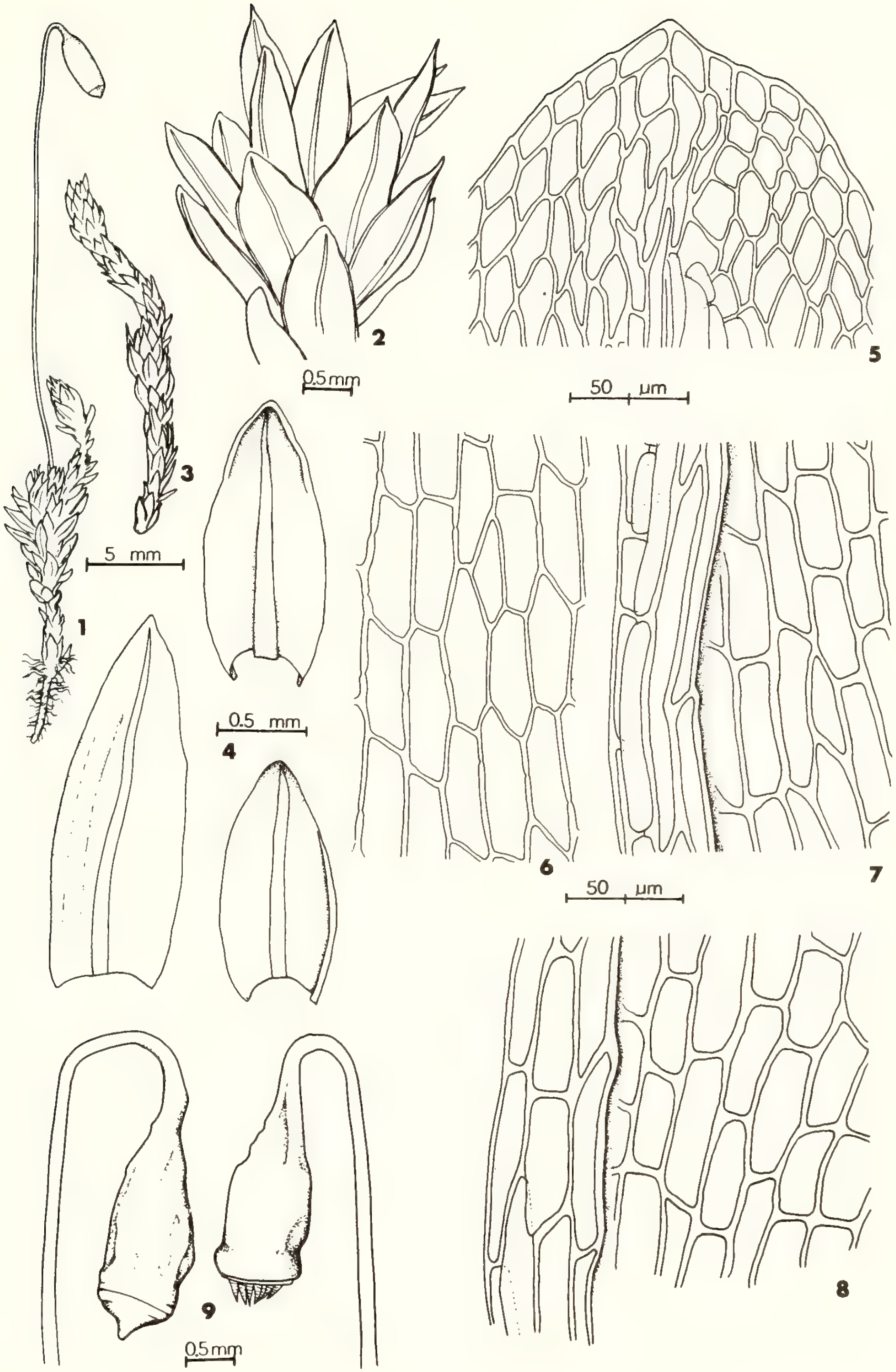
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Plate 179. *Bryum muehlenbeckii*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules (dry).

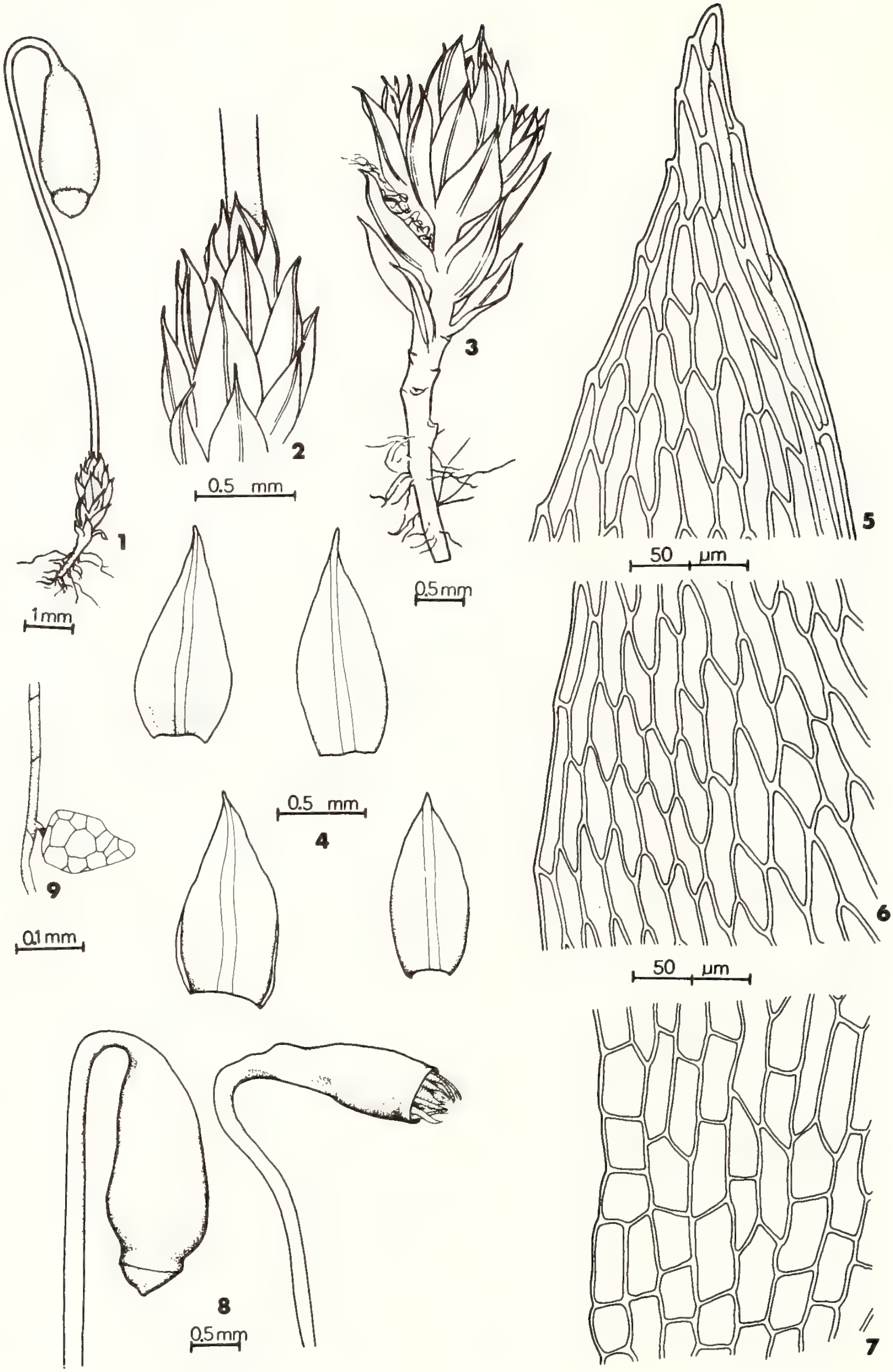
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Plate 180. *Bryum violaceum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Rhizoidal gemma.

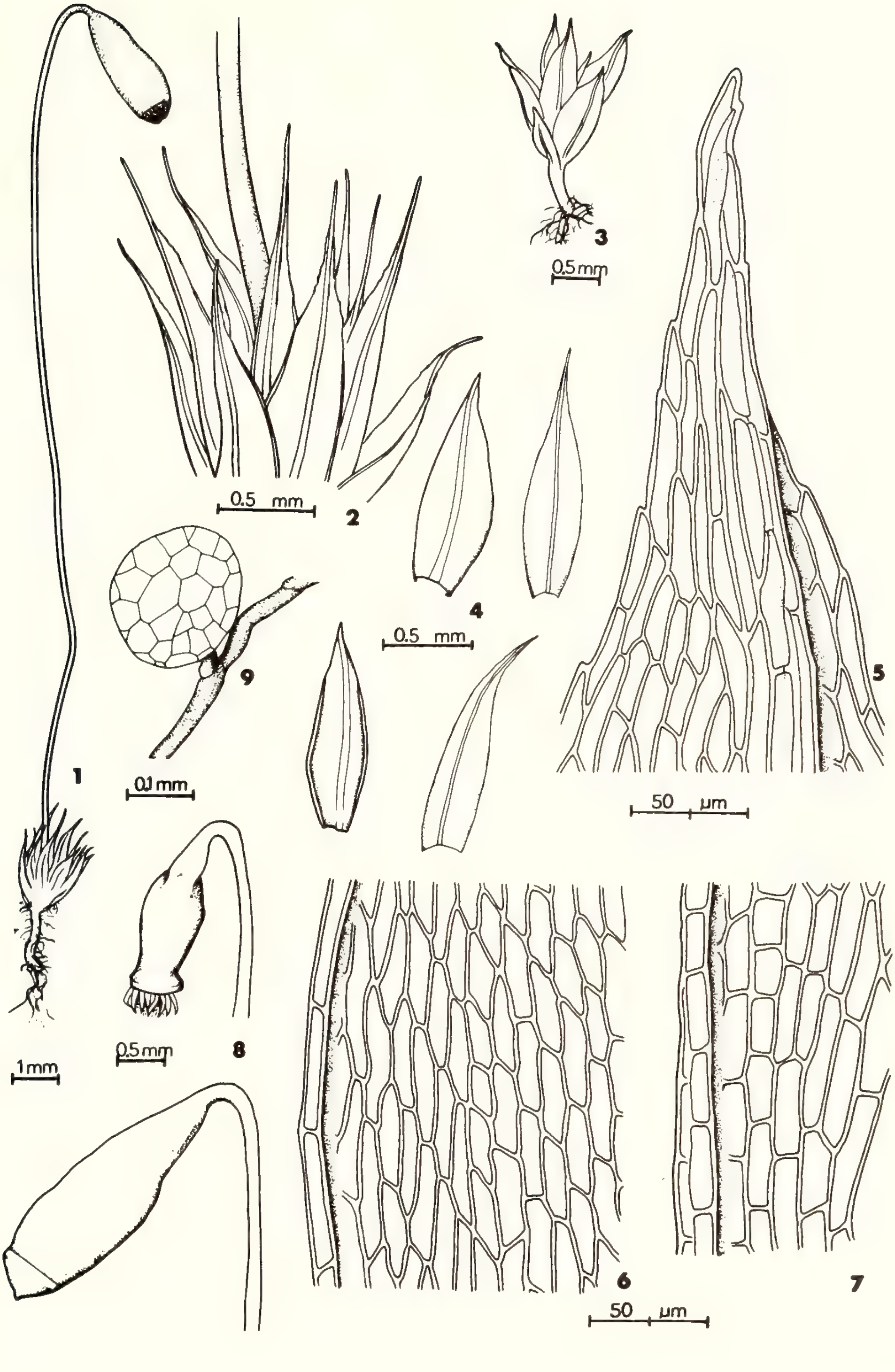
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Plate 181. *Bryum tenuisetum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Rhizoidal gemma.

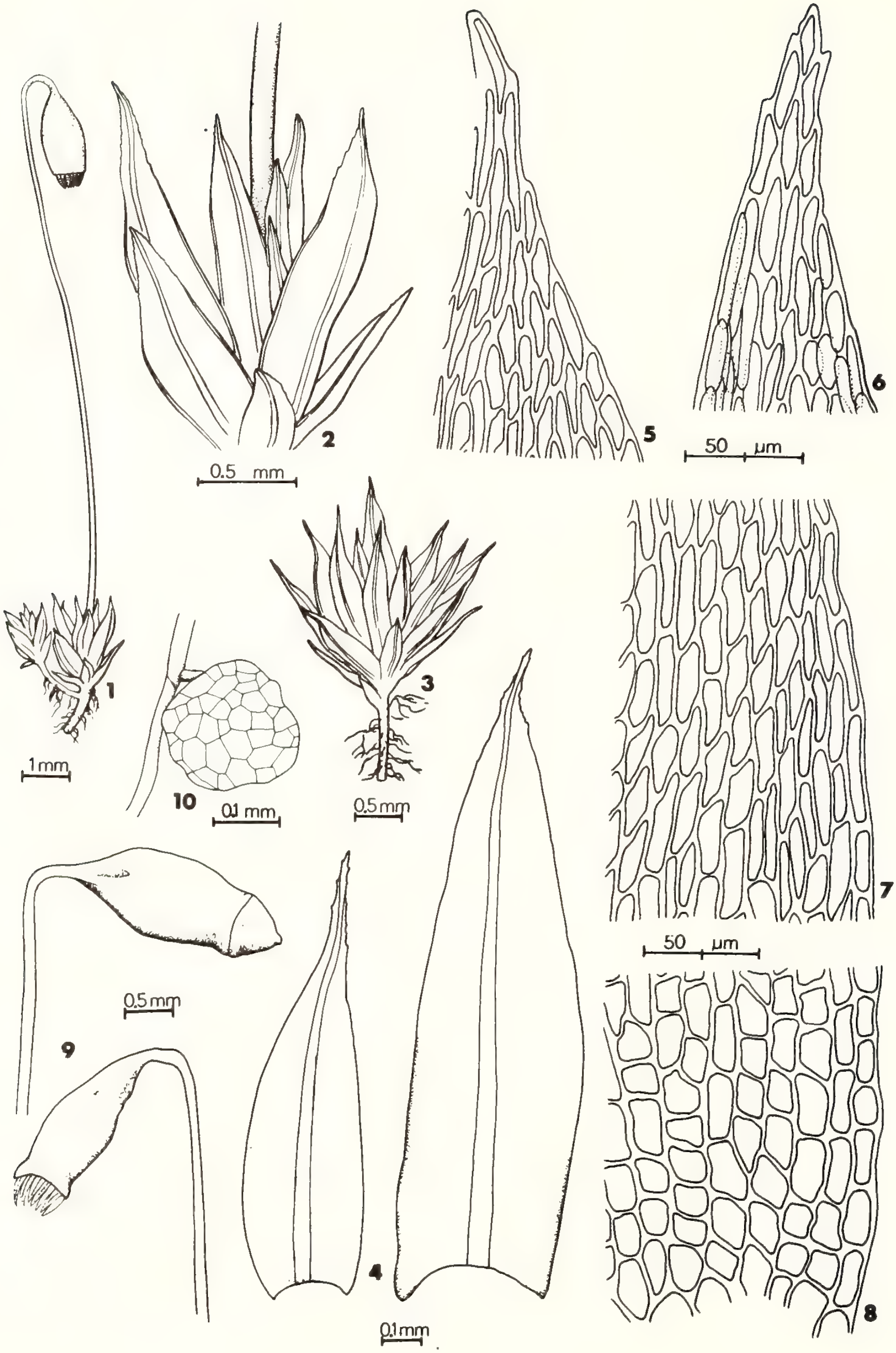
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Plate 182. *Bryum microerythrocarpum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5–6, apical. 7, median-marginal. 8, alar.). 9. Capsules (dry). 10. Rhizoidal gemma.

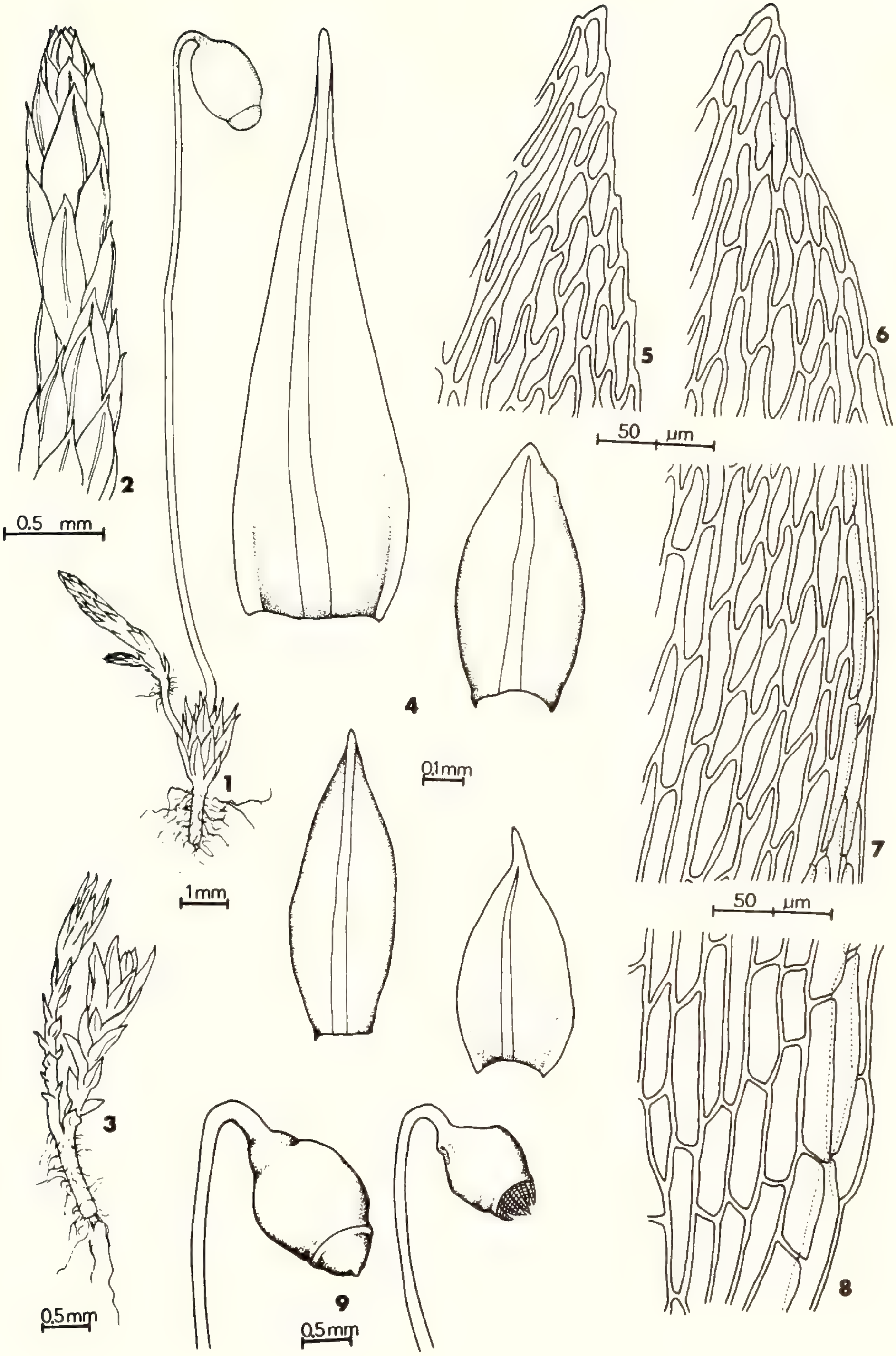
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Plate 183. *Bryum blindii*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5–6, apical. 7, median-marginal. 8, alar.). 9. Capsules (dry).

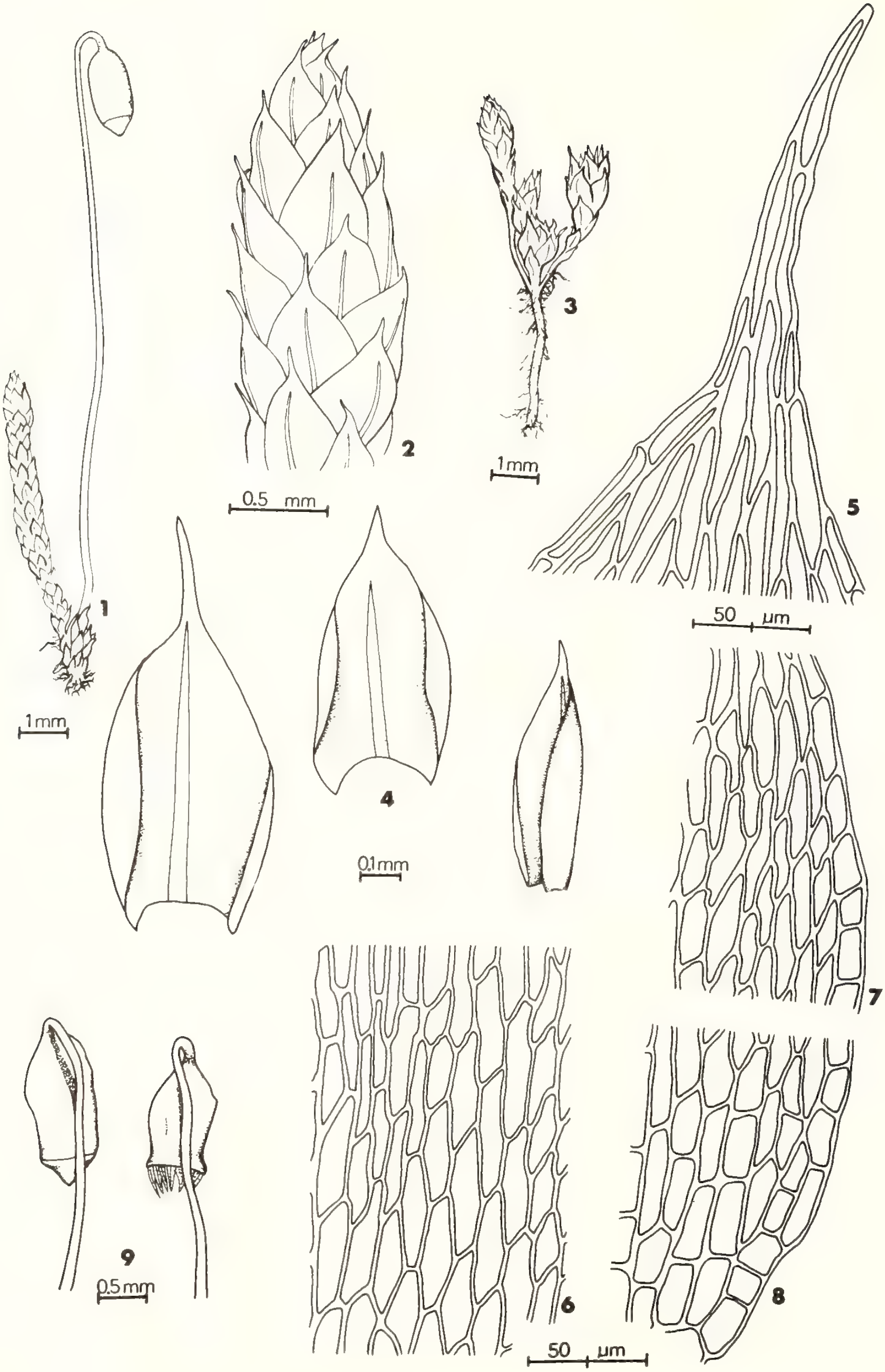
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Plate 184. *Bryum argenteum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules (dry).

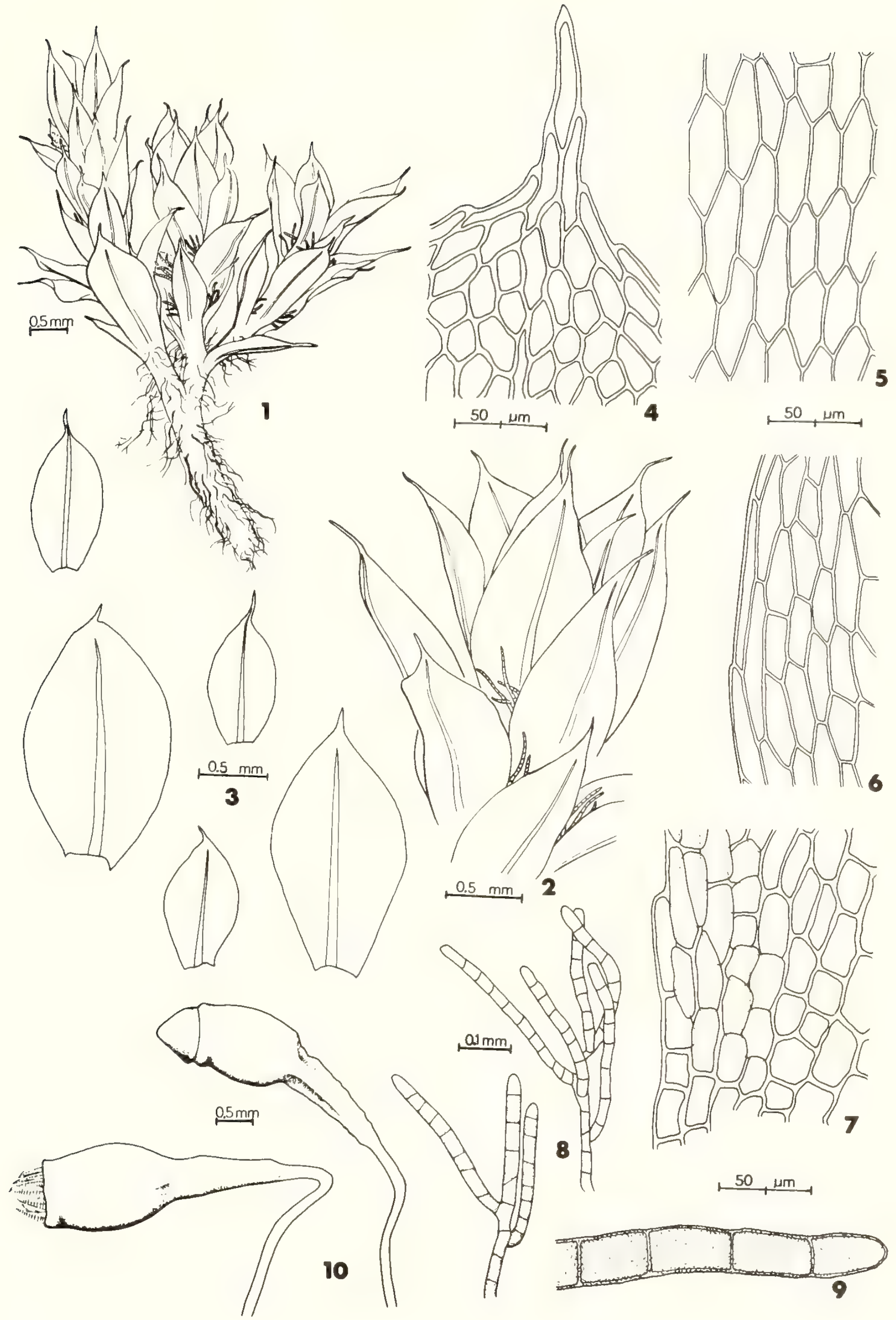
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Plate 185. *Bryum capillare*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Gemmae. 9. Apical portion of gemma. 10. Capsules (dry).

5. **Rhodobryum** (Schimp.) Hampe, Linnaea 38: 663. 1874.
Bryum subgen. *Rhodobryum* Schimp., Syn. 381. 1860.

Habit: Erect, scattered or gregarious, sometimes loosely tufted.

Colour: Dark green, occasionally tinged with red.

Stems: Primary stems lacking leaves, covered with rhizoids, subterranean, secondary stems rosulate, 1–3 cm high, erect, simple, rhizoids at base.

Leaves: Scale-like, small and scarce below, becoming larger and crowded into a rosette at secondary stem tips, wide-spreading, contorted when dry, flat, lamina unistratose, 4–9 mm long, oblong-obovate, acute to cuspidate, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane above, revolute in lower 2/3, serrated or toothed at apex to near leaf middle, entire below.

Costae: Single, percurrent to shortly excurrent into cuspidate apex, prominent on dorsal surface of leaf.

Leaf Cells: Smooth, the walls of medium thickness, pitted, sometimes pits indistinct. Median cells rhomboidal to hexagonal, becoming shorter near apex, longer and rectangular near base, 1–2 rows on margins narrow.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Perigonia and perichaetia terminal.

Calyptrae: Cucullate, naked, yellowish with reddish tip, fugacious.

Capsules: Multiple, 1–5 per perichaetium, on a seta arising from stem apex, yellowish brown to reddish brown, oblong-cylindric, slightly arcuate, horizontal to pendulous, contracted into a short neck, weakly wrinkled when dry.

Setae: Straight, curved or hooked below capsule, smooth, not or little twisted when dry, yellowish brown to reddish brown.

Annuli: Revoluble, deciduous, of 1–2 rows of large cells.

Opercula: Conic.

Peristomes: Double, perfect, bryaceous, exostome yellowish brown, endostome with 3 nodose to appendiculate cilia.

Spores: Yellow to yellowish brown, globose, minutely papillose, 15–24 μm.

1. **Rhodobryum ontariense** (Kindb.) Kindb., Eur. N. Amer. Bryin 2: 346. 1897.
Bryum ontariense Kindb., Ottawa Nat. 2: 155. 1889.
PLATE 186

Plants erect, scattered or in loose tufts, primary stems lacking leaves, rhizome-like, subterranean, secondary stems rosulate, erect, 1–3 cm high; leaves on secondary stems scale-like, small and scarce below, larger and crowded into a rosette at stem tips, wide-spreading, oblong-lanceolate, acute to cuspidate, flat, 4–9 mm long, 1.5–4.0 mm wide, margins plane above, revolute in lower 2/3, with serrations or teeth at apex, costae percurrent to shortly excurrent, leaf cells smooth, median cells rhomboidal to hexagonal, 47–108 μm long, 1–2 rows of narrow cells on margins; dioicous, 1–5 sporophytes per perichaetium, capsules yellowish brown to reddish brown, oblong-cylindric, slightly arcuate, horizontal to pendulous, contracted into a short neck, 4–6 mm long, exserted on setae 2.5–3.5 cm long, opercula conic, peristome perfect, bryaceous.

Habitat: On humus, rotting logs or soil, often over limestone.

Maritime Distribution: Rare or seldom collected. New Brunswick (Restigouche, York); Nova Scotia (Cape Breton, Colchester, Inverness).

Range: Sporadic from Newfoundland to Alberta, south to North Carolina, Tennessee, Arkansas, Oklahoma, and Arizona. Mexico, *Europe, *Asia.

Chromosome Number: n = 11 (erroneously reported as *R. roseum* (Hedw.) Limpr.)

Remarks: Iwatsuki and Koponen (1972) discuss the taxonomy, distribution and ecology of this predominantly eastern North American species and a species it is commonly confused with, *R. roseum* (Hedw.) Limpr., which occurs on this continent only in British Columbia and Alaska.

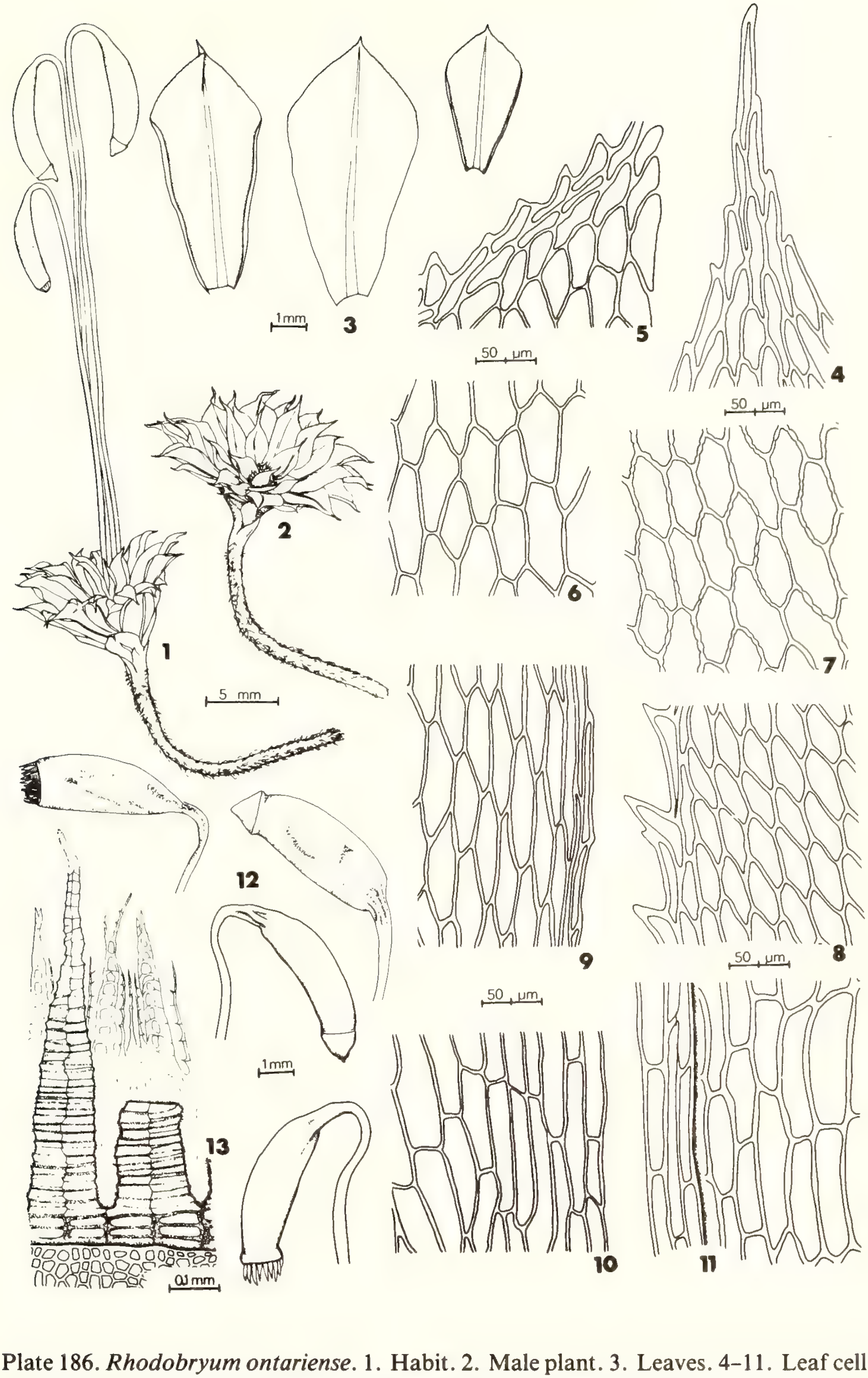
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Plate 186. *Rhodobryum ontariense*. 1. Habit. 2. Male plant. 3. Leaves. 4–11. Leaf cells (4, apical. 5, apical-marginal. 6–7, median. 8, marginal (just above shoulder). 9, median-marginal. 10–11, alar.). 12. Capsules (dry). 13. Peristome teeth.

Family MNIACEAE

1. Leaf margins lacking differentiated border of linear cells or border indistinct 2
    2. Median leaf cells isodiametric or nearly so .... 1. *Mnium* (in part) (p. 334)
    2. Median leaf cells elongate, in diagonal rows .... 3. *Pseudobryum* (p. 349)
1. Leaf margins with clearly differentiated border of linear cells 3
    3. Leaf margins serrate or toothed 4
        4. Leaf margins doubly-serrate or -toothed .... 1. *Mnium* (in part) (p. 334)
        4. Leaf margins singly-serrate or -toothed .... 2. *Plagiomnium* (p. 342)
    3. Leaf margins entire 5
        5. Leaf border unistratose; sporophytes rare, unknown on Maritime plants .... 4. *Cyrtomnium* (p. 351)
        5. Leaf border bistratose to multistratose; sporophytes sometimes present .... 5. *Rhizomnium* (p. 353)

Koponen (1974) has recently studied all the Mniaceae in Canada and he recognizes *Mnium* plus the four segregate genera *Cyrtomnium, Plagiomnium, Pseudobryum*, and *Rhizomnium*. Crum and Anderson (1981) take a much broader view of the family, failing to accept any of the segregate genera, and they recognize only the genus *Mnium* and *Cinclidium* in the Maritimes. Although I have seen the specimen of *Cinclidium arcticum* (B.S.G.) Schimp. collected by J. Macoun in Nova Scotia and reported by them, the species seems to be far out of its northern range and I have excluded it until it is recollected in the Maritimes.

1. **Mnium** Hedw., Spec. Musc. 188. 1801. *nom. cons.*

Habit: In erect, loose to dense tufts.

Colour: Light to dark green, sometimes reddish green.

Stems: 1–5 cm high, stems erect, simple, rhizoids at base.

Leaves: Erect to wide-spreading, contorted when dry, flat to weakly keeled, unistratose, 1-several layers of cells on margins, ovate, ovate-lanceolate, elliptic or obovate, acute to acuminate, nondecurrent or decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, singly serrate and lacking border of linear cells or doubly serrate and with 1-several rows of linear cells, 1-several layers thick.

Costae: Single, subpercurrent to excurrent, smooth or dorsally toothed near apex, prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick, pitted at the base of the leaves. Median cells irregularly angled to rounded, often linear on margins, broad and rectangular near base.

Asexual Reproductive Bodies: Lacking.

Sex: Synoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, rarely 2–3, on a seta arising from stem apex, brown to reddish brown, oblong-cylindric, straight, horizontal to pendulous, smooth.

Setae: Straight to flexuose, curved or hooked below capsule, smooth, not or little twisted when dry, 1 or rarely 2–3 per perichaetium, red or reddish brown, sometimes orange.

Annuli: Revoluble, deciduous, of 2–3 rows of cells.

Opercula: Convex to rostrate.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, yellow, brown, red or purplish brown, endostome yellow to yellowish brown, 2–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 17–34 μm in longest dimension.

1. Leaf margins lacking border of differentiated cells or border indistinct; leaf margins singly serrate or a few teeth in pairs .... 1. *M. stellare*
1. Leaf margins with border of linear cells; leaf margins doubly serrate 2
    2. Costae toothed on dorsal surface; plants dioicous or synoicous 3

3. Leaves long and narrow, 4–6 times as long as wide; costae subpercurrent .... 2. *M. hornum*
3. Leaves short and broad, 2–4 times as long as wide; costae percurrent to excurrent 4
    4. Plants synoicous; costae with dorsal teeth lacking or with 1–2 poorly developed teeth .... 4. *M. marginatum* (in part)
    4. Plants dioicous; costae with dorsal teeth strongly developed .... 3. *M. ambiguum*

2. Costae smooth on dorsal surface; plants synoicous 5
  5. Leaves scarcely reaching 1.5 mm wide; plants seldom with capsules; peristome teeth yellow to light brown .... 4. *M. marginatum* (in part)
  5. Leaves often over 1.5 mm wide and up to 3 mm wide; plants usually with capsules; peristome teeth red to purplish brown .... 5. *M. spinulosum*

1. **Mnium stellare** Hedw., Spec. Musc. 191. 1801.
PLATE 187

This dioicous species has two gametophytic features that distinguish it from the others in the genus, namely the leaves that are without a border of differentiated cells and the leaf margins that are almost always singly serrate. Also, the costa ends farther below the apex than the other *Mnium* species and it lacks teeth on the dorsal surface.

Habitat: On soil, sometimes over limestone, and on bases of trees.

Maritime Distribution: Frequent. New Brunswick (Kent, Queen's, Victoria, York); Nova Scotia (Colchester, Hants).

Range: Nova Scotia to Ontario, south to North Carolina, Tennessee, and Arkansas; also in *British Columbia. Europe, *Asia, *Africa.

Chromosome Number: n = 7.

2. **Mnium hornum** Hedw., Spec. Musc. 188. 1801.
PLATE 188

Dioicous plants with long, narrow leaves (4–6:1), margins bordered with linear cells that are doubly serrate and with subpercurrent costae that are dorsally toothed.

Habitat: Often on sandy soil, sometimes over rock or in rock crevices, on humus and rarely on bases of conifers.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Queen's, Saint John); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth, Sable Island, St. Paul Island); Prince Edward Island (Kings, Queens).

Range: *Labrador and Newfoundland to Ontario, south to South Carolina and Tennessee, Europe, Asia, *Africa.

Chromosome Number: n = 6, 7, 12.

3. **Mnium ambiguum** H. Müll., Verh. Bot. Ver. Brandenburg 8: 71. 1866.
[Synonyms: *Mnium lycopodioides* Schwaegr.; *M. pseudolycopodioides* C. Müll. & Kindb. *ex* Mac. & Kindb.; *M. riparium* Mitt.]
PLATE 189

Dioicous plants with leaves similar to *M. marginatum* but costae with teeth strongly developed on dorsal surface.

Habitat: On soil on bluffs and cliffs (sandstone and limestone) and on bases of conifers.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Madawaska, Queen's, Restigouche, Victoria, Westmorland, York); Nova Scotia (Colchester, Cumberland, Guysborough, Hants, Inverness, Victoria, Yarmouth); Prince Edward Island (Kings).

Range: Labrador to Alaska and British Columbia, south to North Carolina, Michigan, Arkansas, New Mexico, and Washington. Europe, Asia.

Chromosome Number: n = 6.

4. **Mnium marginatum** (With.) Brid. *ex* P. Beauv., Prodr. 75. 1805.
Bryum marginatum Dicks. *ex* With., Syst. Arr. Brit. Pl. ed. 4, 3: 824. 1801.
[Synonym: *M. serratum* Schrad. *ex* Brid.]
PLATE 190

Synoicous plants with short, broad leaves (2–3:1), margins bordered with linear cells that are doubly serrate and with percurrent or excurrent costae that lack dorsal teeth or have poorly developed ones.

Habitat: On soil on bluffs and cliffs, frequently calcareous, sometimes on humus.

Maritime Distribution: Frequent. New Brunswick (Albert, Carleton, King's, Victoria); Nova Scotia (Victoria).

Range: *Labrador to Alaska and British Columbia, south to North Carolina, Tennessee, Arkansas, Colorado, Arizona, and Oregon. *Central America, Europe, *Asia, *Africa.

Chromosome Number: n = 12.

5. **Mnium spinulosum** B.S.G., Bryol. Eur. 4: 206. 394. 1846 (fasc. 31 Mon. Suppl. 1: 4. 4). PLATE 191

Synoicous plants with broad leaves, often over 1.5 mm wide, margins bordered with linear cells that are doubly serrate and with percurrent or excurrent costae that lack dorsal teeth. Usually producing sporophytes that have a red to purplish brown exostome which distinguishes it from the other *Mnium* species whose teeth are yellow to light brown.

Habitat: On humus, rotten logs and stumps, bases of trees, sometimes on sandstone.

Maritime Distribution: Common. New Brunswick (Carleton, Charlotte, King's, Restigouche, Victoria, York); Nova Scotia (Guysborough, Inverness, Kings, Lunenburg, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Labrador to Alaska and British Columbia, south to *Maryland, Michigan, Wisconsin, Minnesota, Colorado, and Washington. Europe.

Chromosome Number: n = 8.

Remarks: One of the easiest to recognize of all *Mnium* species in Canada because of the colour of the peristome teeth.

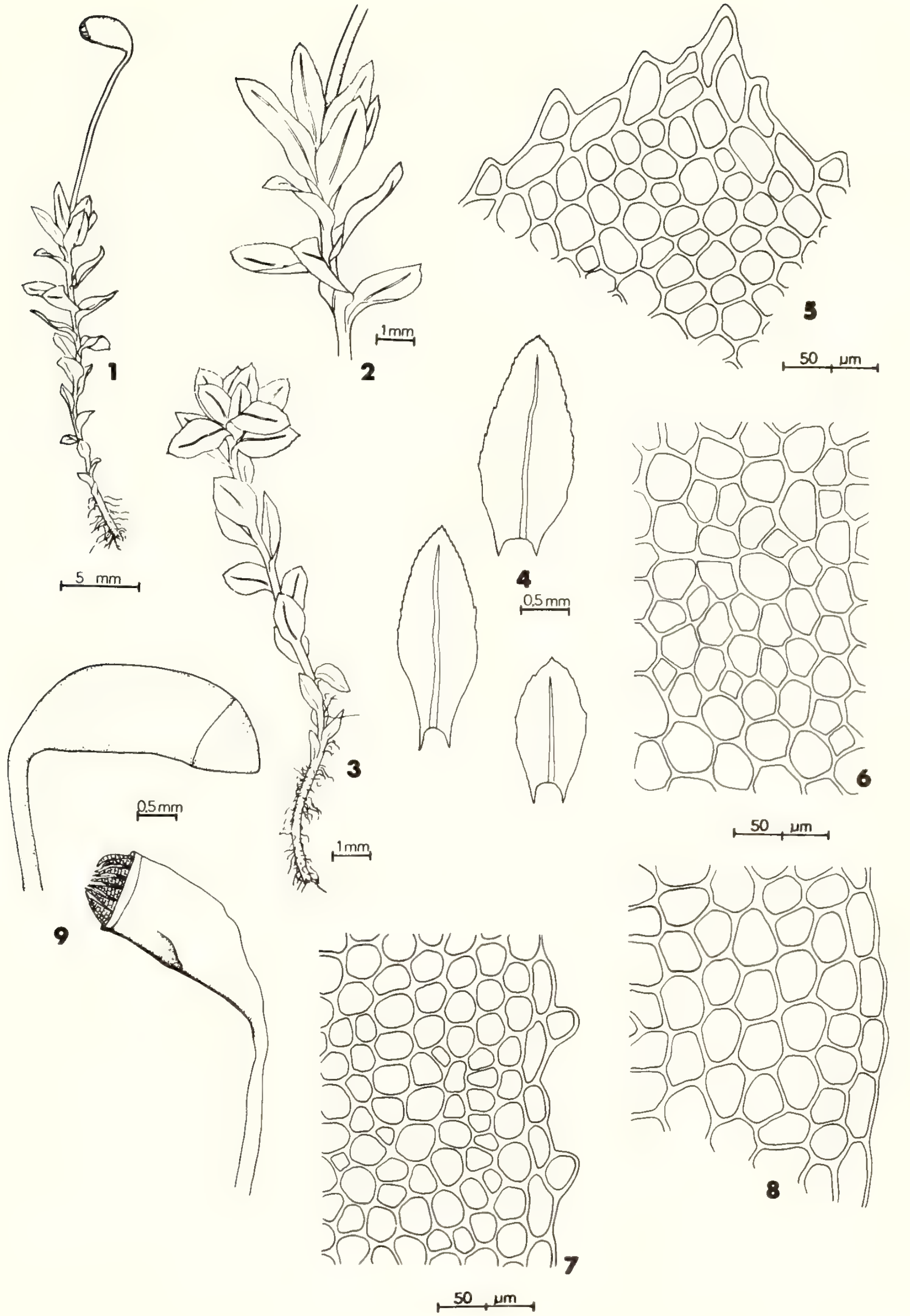
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Plate 187. *Mnium stellare*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

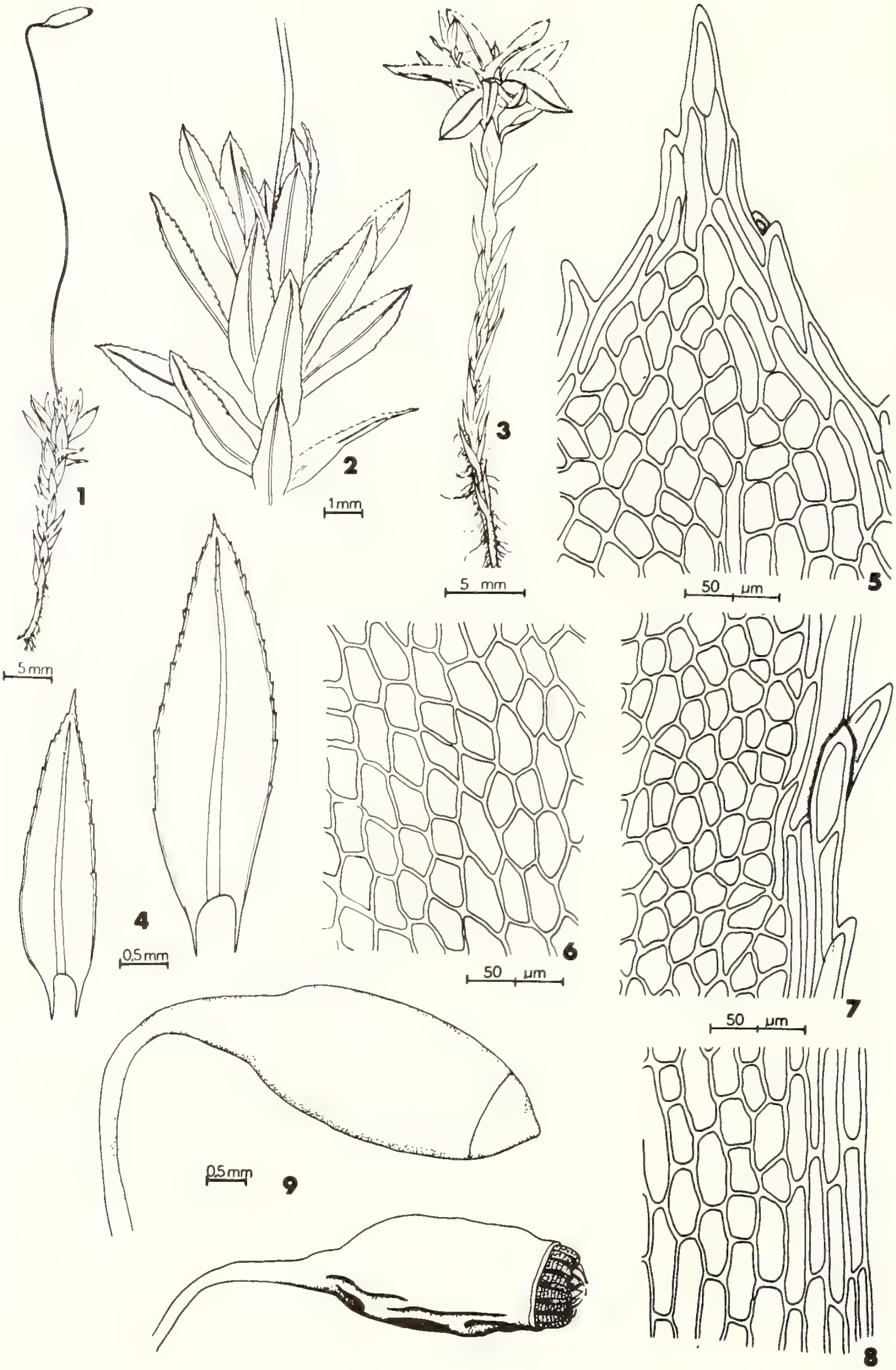
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Plate 188. *Mnium hornum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical on dorsal surface. 6, median. 7, median-marginal, showing paired teeth. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

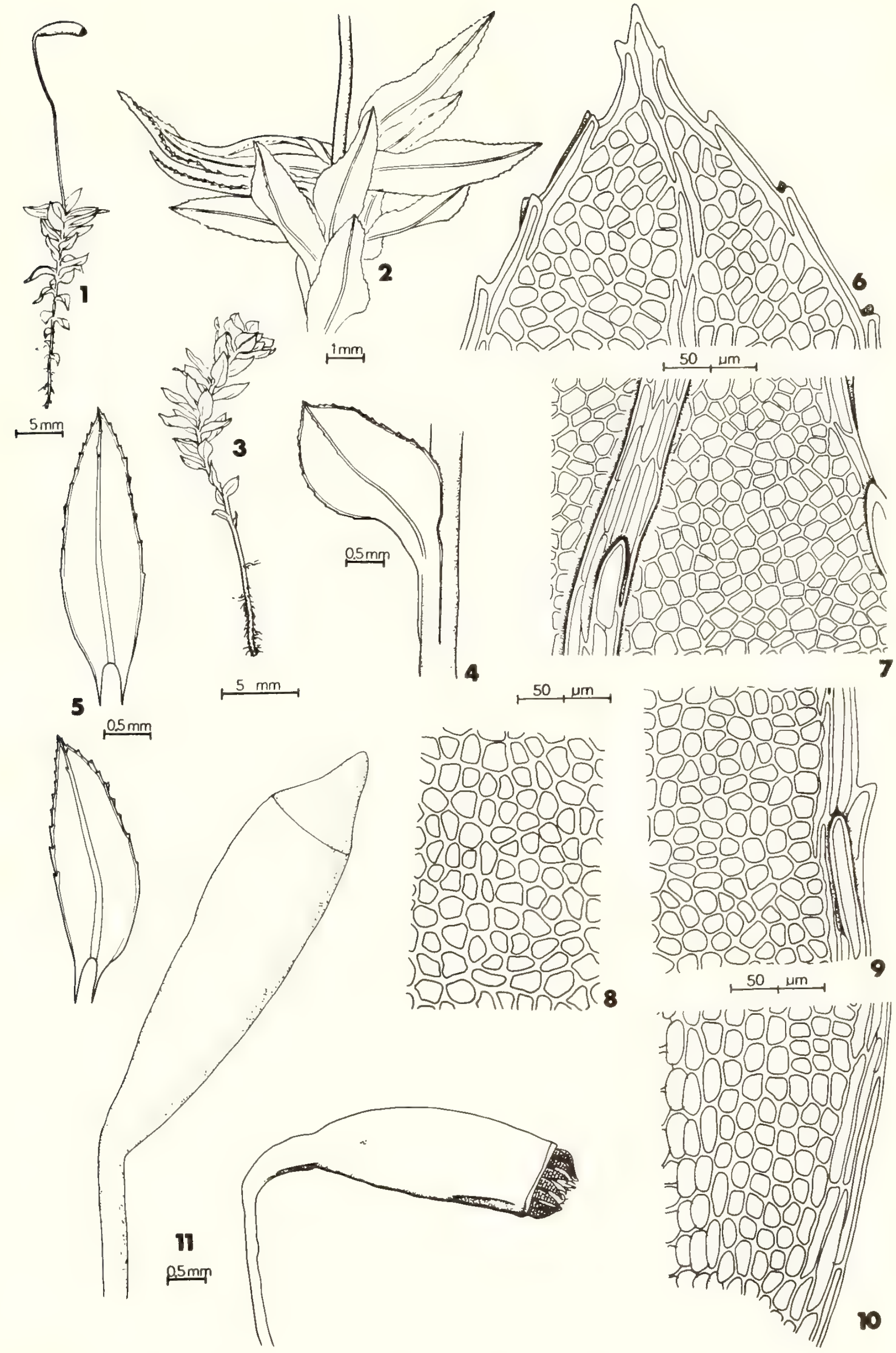
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Plate 189. *Mnium ambiguum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Portion of stem showing long-decurrent leaf. 5. Leaves. 6–10. Leaf cells (6, apical. 7, upper on dorsal surface just below apex showing tooth on costa. 8, median. 9, median-marginal, showing paired teeth. 10, alar.). 11. Capsules, operculate (wet), inoperculate (dry).

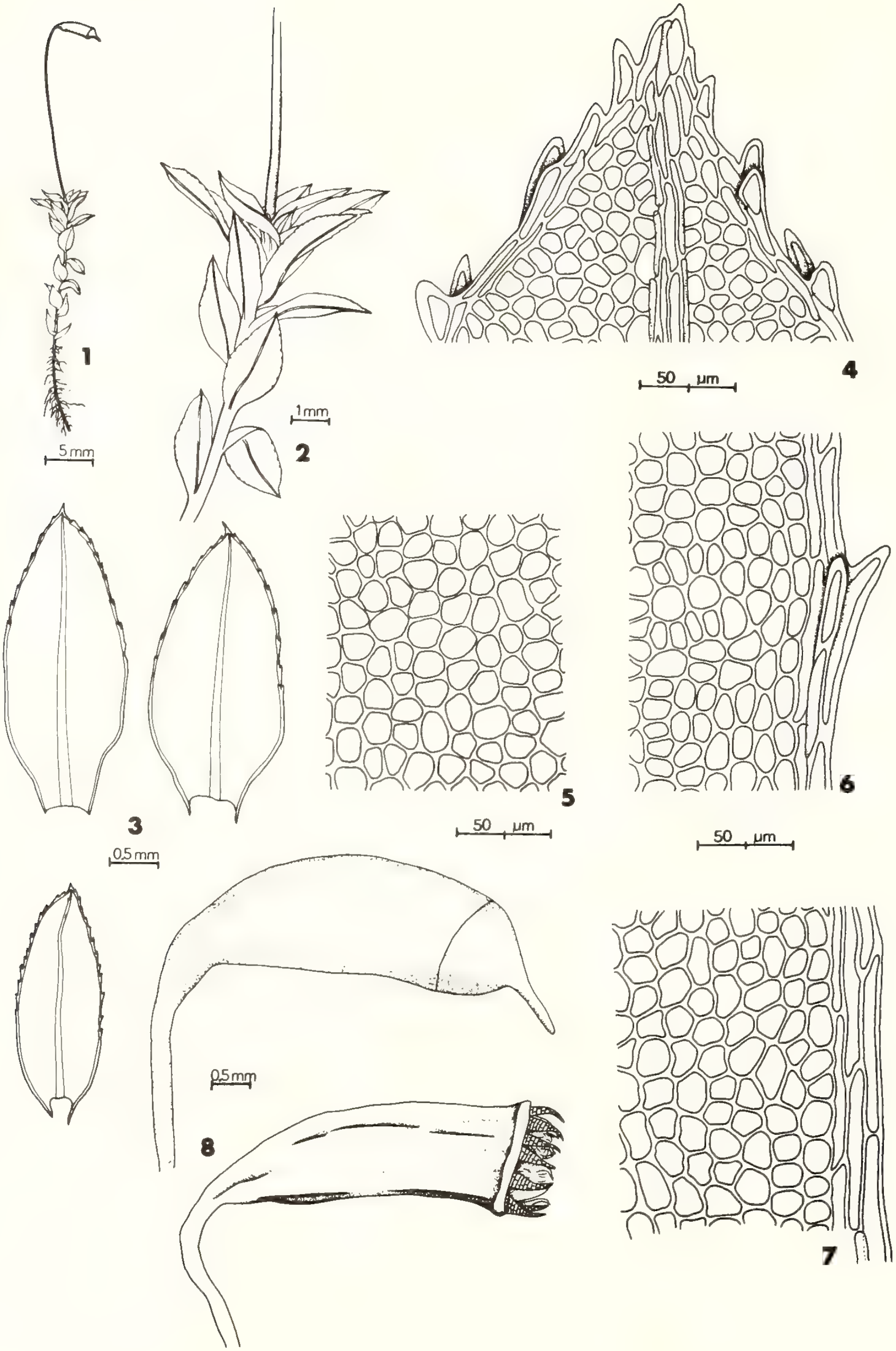
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Plate 190. *Mnium marginatum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical on dorsal surface. 5, median. 6, median-marginal, showing paired teeth. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

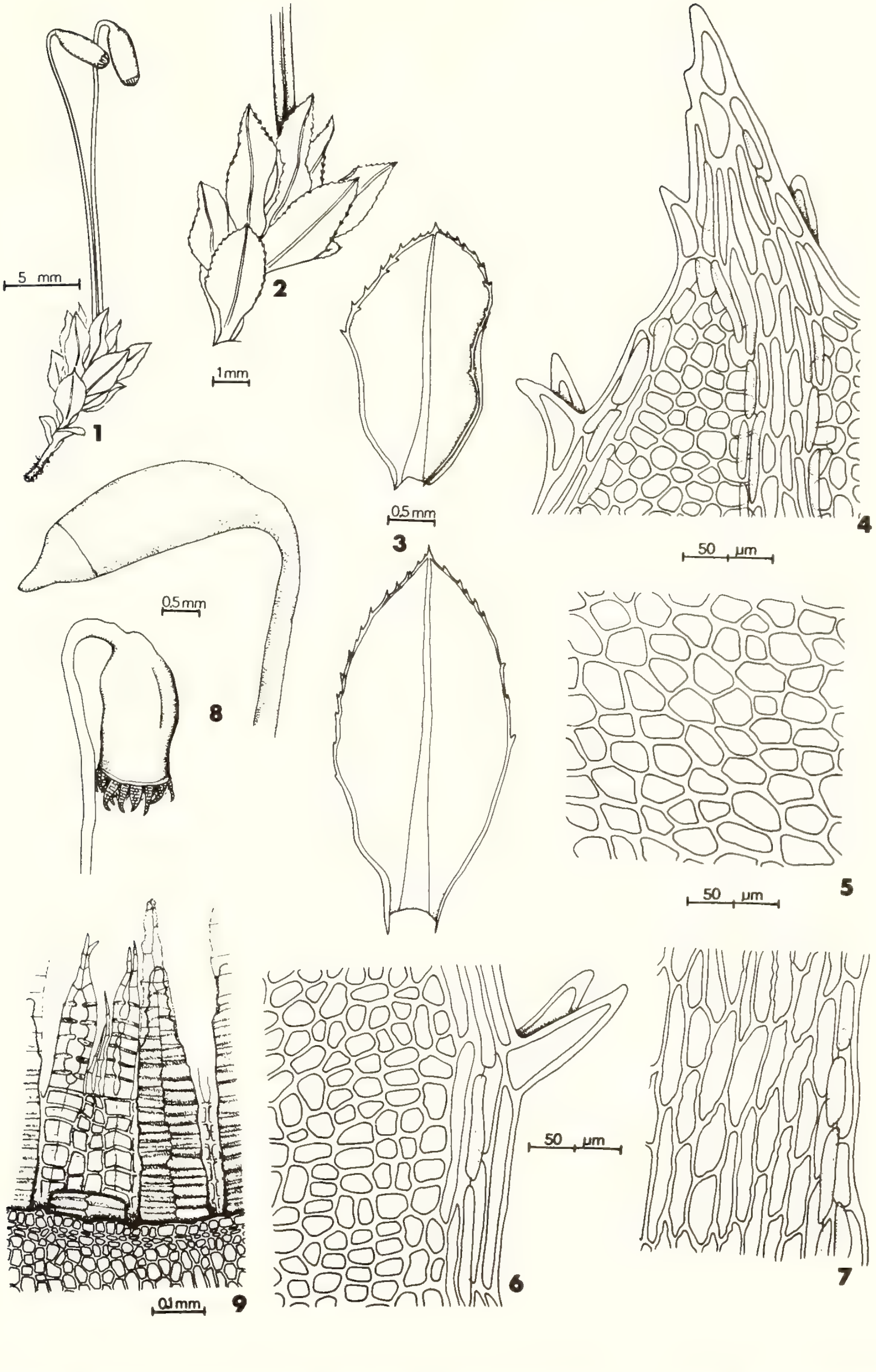
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Plate 191. *Mnium spinulosum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical on dorsal surface. 5, median. 6, median-marginal, showing paired teeth. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome teeth.

2. **Plagiomnium** Kop., Ann. Bot. Fenn. 5: 145. 1968.

Habit: In erect, loose to dense tufts. Sterile, stoloniform plants with a prostrate habit often present.

Colour: Light to dark green, sometimes yellowish green.

Stems: 2–8 cm high, fertile stems erect, stoloniferous stems prostrate, simple, rhizoids at base and sometimes above on fertile stems, mostly on undersurface and at tips of stoloniferous stems.

Leaves: Erect to wide-spreading, somewhat complanate on stoloniferous stems, contorted when dry, flat to weakly keeled, unistratose, obovate, oblong-obovate or elliptic, acute to acuminate, sometimes apiculate, decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, bordered by 1-several rows of linear cells in 1 layer, toothed, the teeth single, composed of 1–4 cells, either extending to middle of leaf or to base, sometimes nearly lacking.

Costae: Single, percurrent to excurrent, smooth, prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick, pitted or lacking pits. Median cells irregularly angled, rounded or hexagonal, linear on margins, broad and rectangular near base.

Asexual Reproductive Bodies: Lacking.

Sex: Synoicous or dioicous *(P. ciliare)*.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, sometimes 2–5, on a seta arising from stem apex, yellow or brown, oblong-cylindric, straight, horizontal to pendulous, smooth.

Setae: Straight to flexuose, curved or hooked below capsule, smooth, not or little twisted when dry, 1 or sometimes 2–5 per perichaetium, yellow, brown, orange or red.

Annuli: Revoluble, deciduous, of 2–3 rows of cells.

Opercula: Conic to rostrate.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, yellow or brown, endostome yellow to yellowish brown, 2–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 16–33 μm in longest dimension.

1. Leaves obovate, margins toothed to middle, rarely below 2
    2. Leaves dark green, dull, cells irregularly rounded to hexagonal, small, 25 μm or less in longest dimension; setae solitary .... 1. *P. cuspidatum*
    2. Leaves light green, shiny, cells hexagonal, large, mostly over 25 μm in longest dimension; setae 1–3 .... 2. *P. drummondii*
1. Leaves ± elliptic, margins toothed to base or nearly so 3
    3. Median leaf cells large, often over 50 μm in longest dimension; synoicous; setae 1–5 .... 4. *P. medium*
    3. Median leaf cells small, mostly less than 50 μm in longest dimension; dioicous or rarely synoicous; setae solitary, rarely 2–4 4
        4. Teeth on leaf margins often composed of 3 or more cells; dioicous; setae solitary; operculum conic to apiculate .... 3. *P. ciliare*
        4. Teeth on leaf margins composed of 1–2 cells; synoicous; setae 1–4; operculum long-rostrate .... 5. *P. rostratum*

1. Plagiomnium cuspidatum (Hedw.) Kop., Ann. Bot. Fenn. 5: 146. 1968.

Mnium cuspidatum Hedw., Spec. Musc. 192. 1801.

PLATE 192

Leaves obovate with margins toothed to near the middle. Close to *P. drummondii* but the plants have dull, dark green leaves with small cells (25 μm or less in longest dimension), short marginal teeth and solitary sporophytes.

Habitat: On soil, humus, rocks, bases of trees, rotten logs and stumps in woodlands.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Madawaska, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Inverness, Kings, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Labrador to Alaska, south to the Gulf States, Colorado, Arizona, and *Oregon. Europe, *Asia, *Africa.

Chromosome Number: n = 6, 12.

2. Plagiomnium drummondii (Bruch & Schimp.) Kop., Ann. Bot. Fenn. 5: 146. 1968.
Mnium drummondii Bruch & Schimp., London J. Bot. 2: 669. 1843.
PLATE 193

Leaves obovate with margins toothed to near the middle. Somewhat similar to *P. cuspidatum* but the plants have shiny, light green leaves with large cells (mostly 25 μm or more in longest dimension), long marginal teeth and often multiple sporophytes.

Habitat: On soil, humus, rotten logs and stumps in woodlands.

Maritime Distribution: Rare. New Brunswick (Madawaska, Northumberland, Victoria); Nova Scotia (Colchester).

Range: Nova Scotia to British Columbia, south to *Maryland, *Michigan, Minnesota, Montana, and *Washington. Europe, Asia.

Chromosome Number: n = 6.

Remarks: This is the only species of *Plagiomnium* in the Maritime Provinces with superficial stomata.

3. Plagiomnium ciliare (C. Müll.) Kop., Ann. Bot. Fenn. 5: 146. 1968.
Mnium affine var. *ciliare* C. Müll., Syn. 1: 159. 1848.
[Synonym: *Mnium ciliare* (C. Müll.) Schimp.]
PLATE 194

Leaves ± elliptic with margins toothed nearly to base. Dioicous plants with solitary sporophytes, teeth on leaf margins often composed of 2–4 cells, and small median cells (mostly less than 50 μm in longest dimension).

Habitat: On soil, humus, rocks, bases of trees, rotten logs and stumps.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Restigouche, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Hants, Inverness, Kings, Pictou, Victoria); Prince Edward Island (Prince, Queens).

Range: Endemic to North America from Labrador to Alaska, south to Florida, Alabama, Louisiana, Texas, and Montana.

Chromosome Number: n = 6.

Remarks: *Plagiomnium affine* (Funck) Kop. (*Mnium affine* Bland. *ex* Funck) has been reported for the Maritimes but it does not occur in Canada. Most specimens named that species are *P. ciliare*.

4. Plagiomnium medium (B.S.G.) Kop., Ann. Bot. Fenn. 5: 146. 1968.
Mnium medium B.S.G., Bryol. Eur. 4: 196. 398. 1838 (fasc. 5 Mon. 32.10).
PLATE 195

Leaves ± elliptic with margins toothed nearly to base. Synoicous plants with multiple sporophytes, teeth on leaf margins composed of 1 or rarely 2 cells, and large median cells (often over 50 μm in longest dimension).

Habitat: On soil, humus, rocks, often in wet depressions in woods.

Maritime Distribution: Common. New Brunswick (Albert, Kent, Madawaska, Restigouche, York); Nova Scotia (Annapolis, Cumberland, Inverness, Victoria); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to Tennessee, Arkansas, Colorado, Arizona, and California. Europe, Asia.

Chromosome Number: n = 12.

5. Plagiomnium rostratum (Schrad.) Kop., Ann. Bot. Fenn. 5: 147. 1968.
Mnium rostratum Schrad., Bot. Zeit. Regensburg 1: 79. 1802.
[Synonym: *Mnium longirostrum* Brid.]
PLATE 196

Leaves ± elliptic with margins toothed nearly to base. Synoicous plants with multiple sporophytes, teeth on leaf margins composed of 1–2 cells, and small median cells (mostly less than 50 μm in longest dimension). The capsules have a long-rostrate operculum in contrast to the conic one of the other species whose leaf margins are toothed nearly to the base, namely *P. ciliare* and *P. medium*. Also, the stomata are immersed and are scattered over the entire capsule, while in *P. ciliare* and *P. medium* they are confined to the neck.

Habitat: On calcareous rock bluff.

Maritime Distribution: Rare. New Brunswick (Victoria). Known from one collection 0.8 km east of Kilburn, 9 July 1970 *(Ireland 12795).*

Range: *Newfoundland to British Columbia, south to Tennessee, Louisiana, Montana, and Oregon. Central and South America, West Indies, Europe, Asia, *Africa, Australia, *New Zealand, Pacific Islands.

Chromosome Number: n = 12.

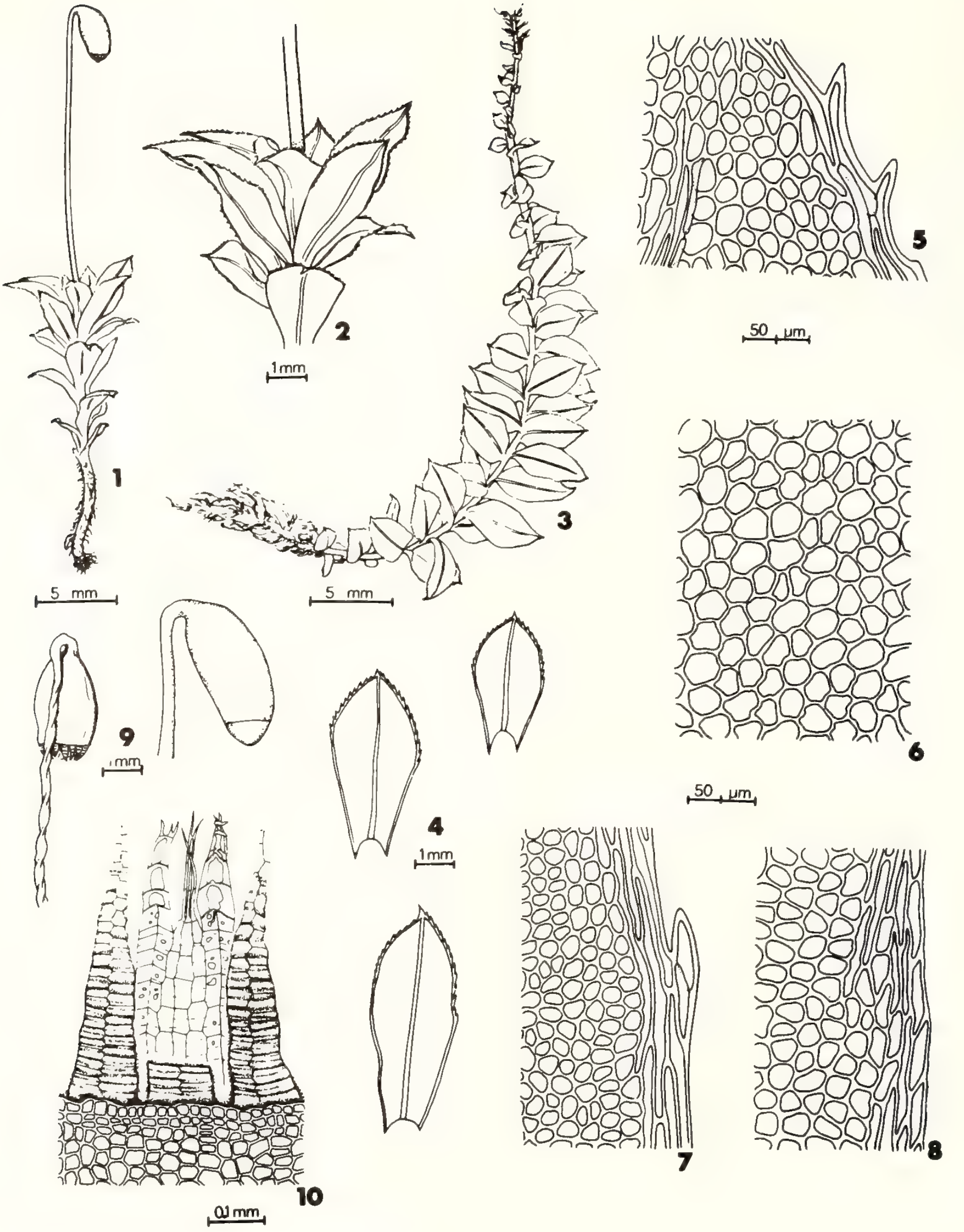
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Plate 192. *Plagiomnium cuspidatum*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of sterile shoot. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal, showing single tooth. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

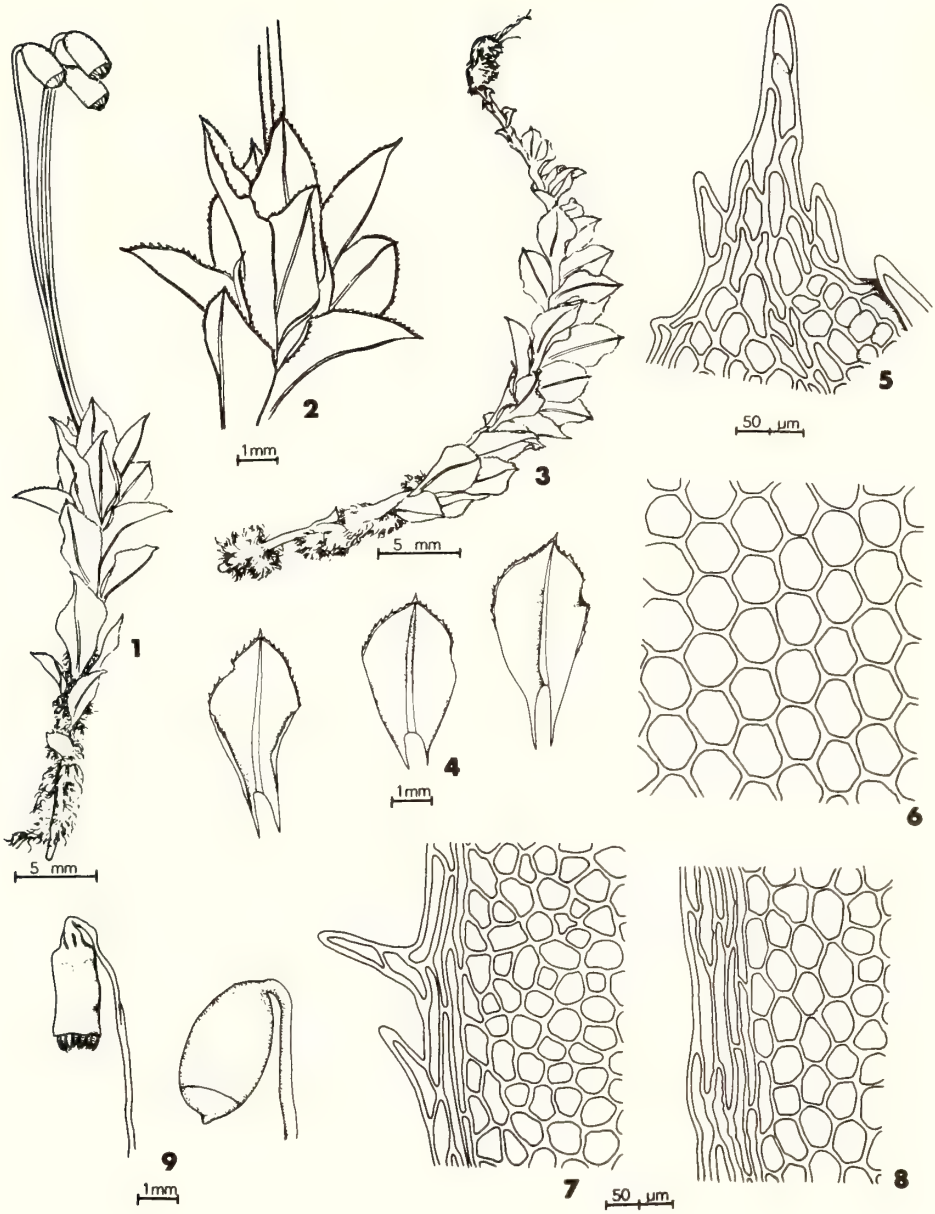
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Plate 193. *Plagiomnium drummondii*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of sterile shoot. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal, showing single teeth. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

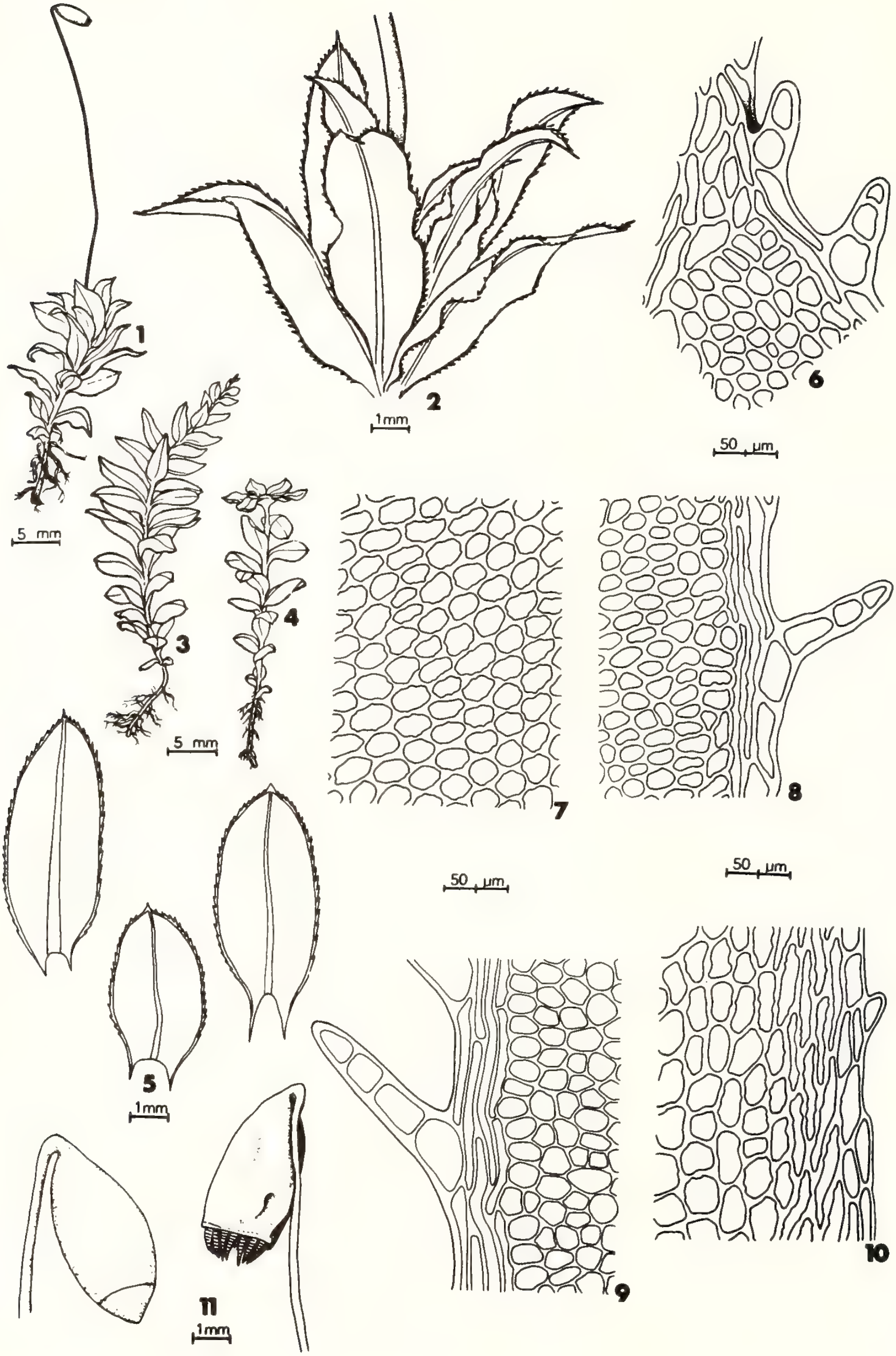
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Plate 194. *Plagiomnium ciliare*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of sterile shoot. 4. Male plant. 5. Leaves. 6–10. Leaf cells (6, apical. 7, median. 8–9, median-marginal, showing single tooth. 10, alar.). 11. Capsules, operculate (wet), inoperculate (dry).

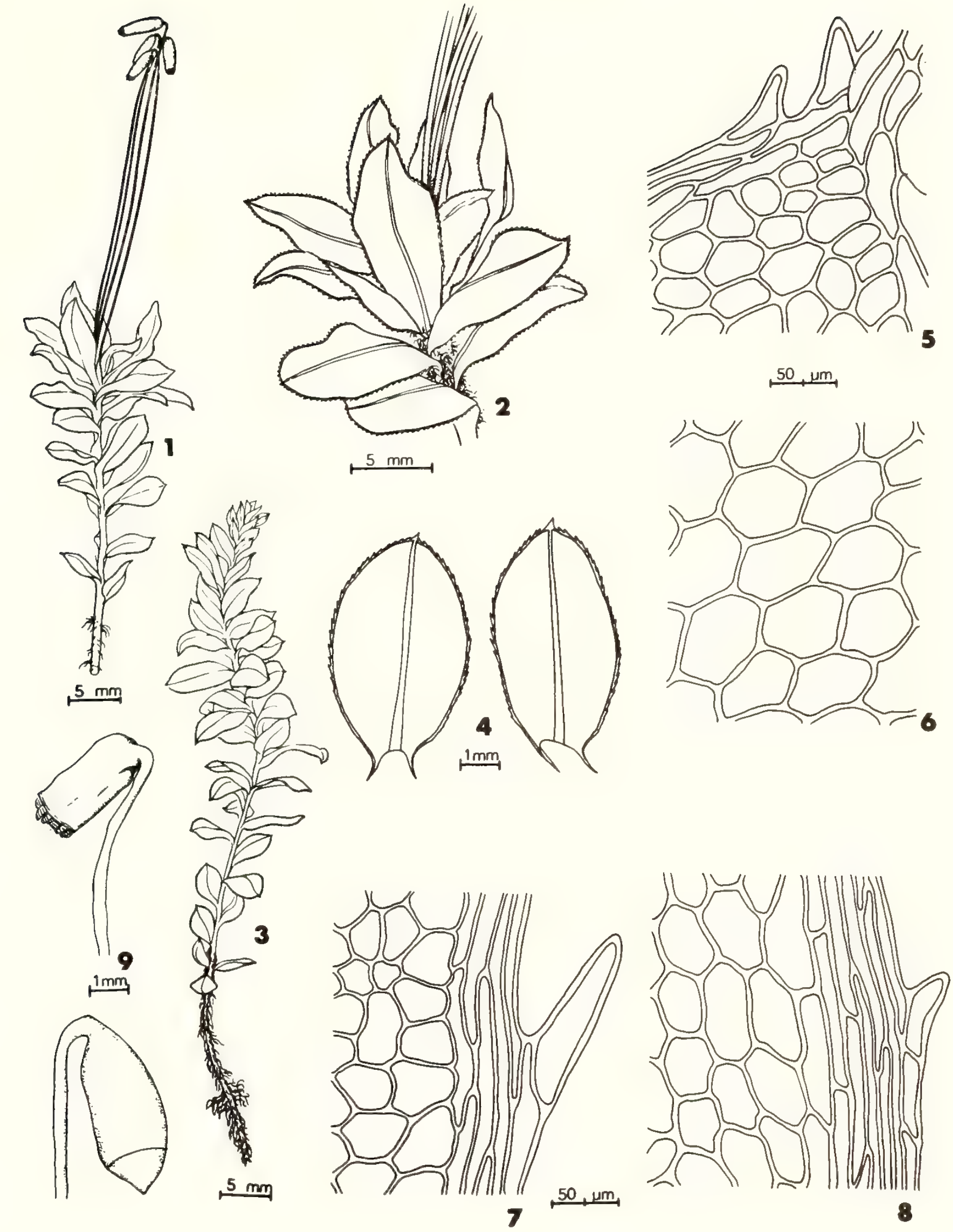
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Plate 195. *Plagiomnium medium*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of sterile shoot. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal, showing single tooth. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

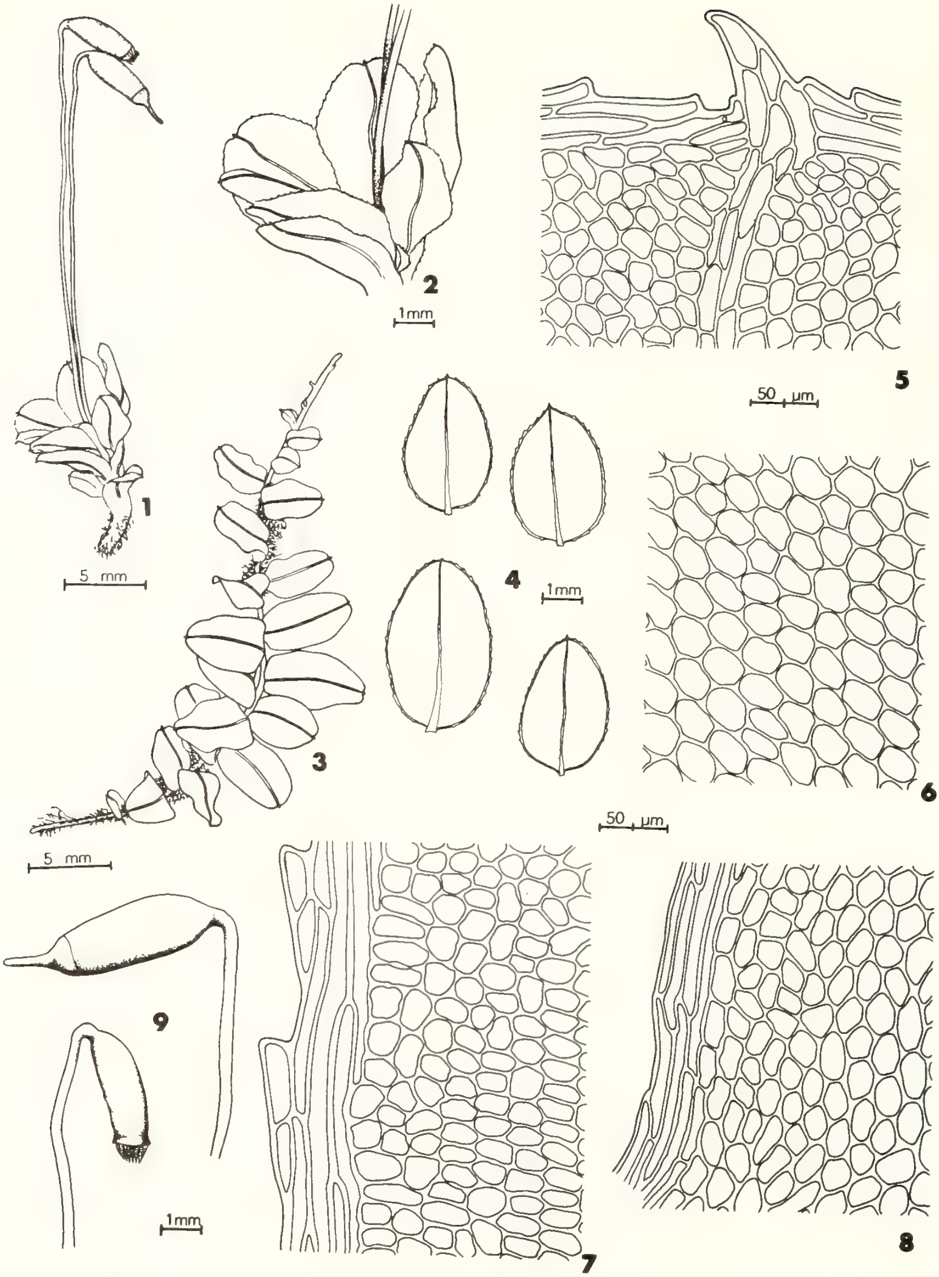
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Plate 196. *Plagiomnium rostratum*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of sterile shoot. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal, showing single teeth. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

3. **Pseudobryum** (Kindb.) Kop., Ann. Bot. Fenn. 5: 147. 1968.

Mnium I. *Pseudo-Bryum* Kindb., Eur. N. Amer. Bryin. 2: 338. 1897.

Habit: In erect, loose tufts.

Colour: Green to yellowish green.

Stems: 2–10 cm high, erect, simple, rhizoids from base to near apex.

Leaves: Erect to erect-spreading, contorted when dry, flat, unistratose, elliptic, rounded or bluntly apiculate, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, often indistinctly bordered by 1-several rows of elongated cells in 1 layer, entire to bluntly serrate throughout.

Costae: Single, subpercurrent, smooth, slightly prominent on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, pitted or lacking pits. Median cells elongate-rhomboidal, arranged in diagonal rows, broad and rectangular near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellow to brown, ovoid to ellipsoidal, straight, pendulous, smooth.

Setae: Straight to flexuose, smooth, not or little twisted when dry, yellow to reddish.

Annuli: Revoluble, deciduous, of 2–3 rows of cells.

Opercula: Conic.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, dark brown, endostome yellow to yellowish brown, 2–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 29–41 μm in longest dimension.

1. **Pseudobryum cinclidioides** (Hüb.) Kop., Ann. Bot. Fenn. 5: 147. 1968.

Mnium cinclidioides Hüb., Musc. Germ. 416. 1833.

PLATE 197

Recognized by the large, elliptic leaves, 5–7 mm long, with rounded or bluntly apiculate apices, margins entire or with a few blunt teeth, without or with an indistinct border of elongated cells, and large, elongated laminal cells arranged in diagonal rows. Sporophytes are rarely produced.

Habitat: On soil or humus on swampy ground or in wet depressions in woods, sometimes on boulders or exposed tree roots.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Queen's, Saint John, York); Nova Scotia (Annapolis, Colchester, Cumberland, Halifax, Kings, Queens, Victoria); Prince Edward Island (Prince, Queens).

Range: Greenland to Alaska, south to Virginia, Michigan, Minnesota, and *Montana. Europe, Asia.

Chromosome Number: $n = 6, 7$.

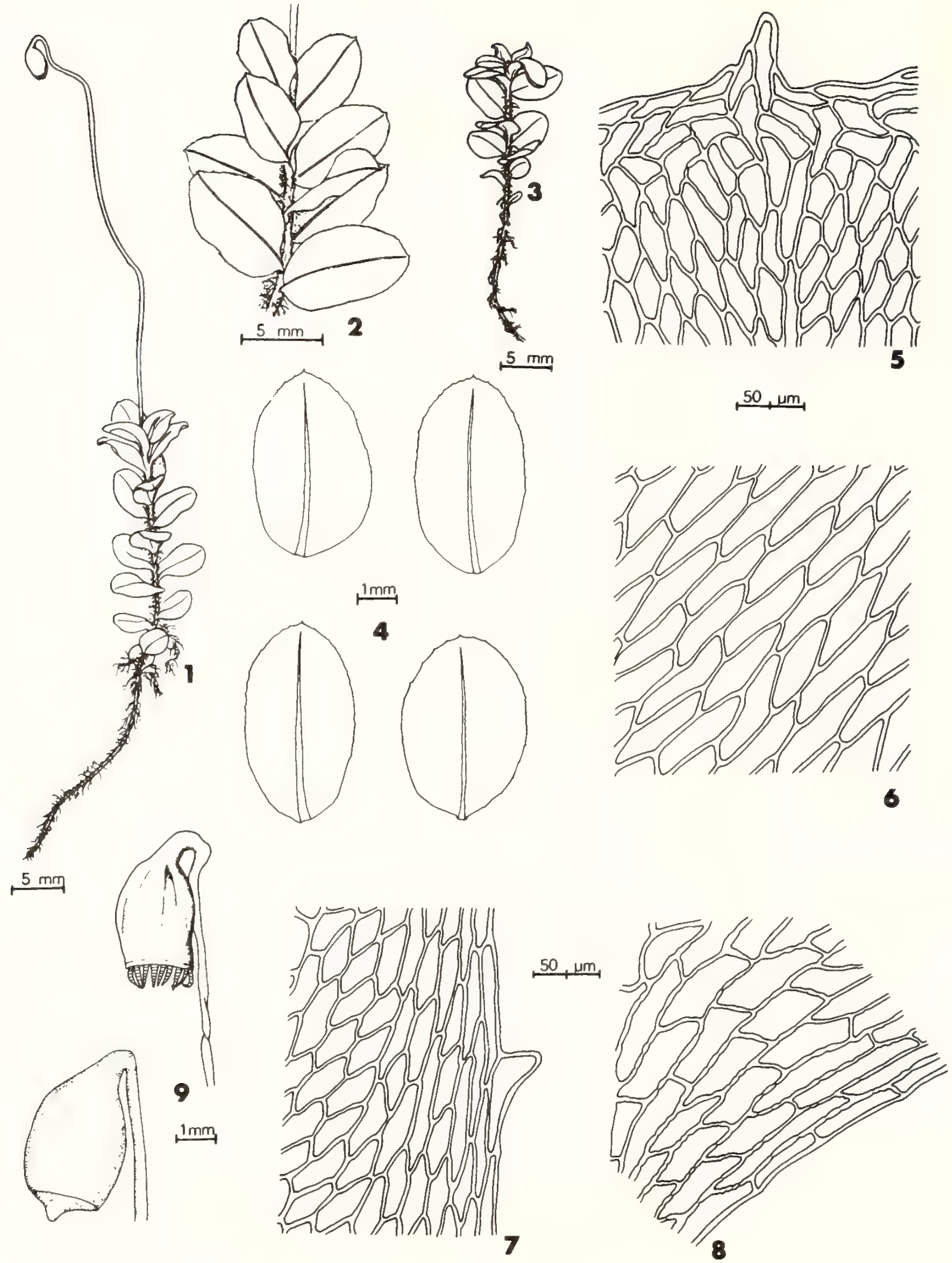
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Plate 197. *Pseudobryum cinclidioides*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

4. **Cyrtomnium** Holmen, Bryologist 60: 138. 1957.

Habit: In erect, loose tufts.
Colour: Light green to bluish green.
Stems: 1–3 cm high, erect, simple, rhizoids at base.
Leaves: Erect to spreading, slightly contorted when dry, flat, unistratose, ovate, acute to apiculate, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane, bordered by 2–4 rows of linear cells in 1 layer, entire.
Costae: Single, subpercurrent, smooth, prominent on dorsal surface.
Leaf cells: Smooth, the walls of medium thickness, pitted or lacking pits. Median cells rounded-hexagonal, linear on margins, somewhat elongate at base.
Asexual Reproductive Bodies: Lacking.
Sex: Dioicous.
Sporophyte: Reported to be the same as *Mnium*.

1. **Cyrtomnium hymenophylloides** (Hüb.) Kop., Ann. Bot. Fenn. 5: 143. 1968.
Mnium hymenophylloides Hüb., Musc. Germ. 416. 1833.
PLATE 198

Plants bluish green, leaves ovate, apices acute to apiculate, margins entire with a unistratose border of 2–4 rows of linear cells, and costae subpercurrent. Sporophytes unknown on Maritime plants.

Habitat: On soil on calcareous cliffs.
Maritime Distribution: Rare. New Brunswick (Victoria); Nova Scotia (Victoria).
Range: In the northern part of North America from Greenland to Alaska. Europe, *Asia.
Chromosome Number: n = 6, 7.
Remarks: *Cyrtomnium* is morphologically close to *Rhizomnium* but plants belonging to the latter genus have bistratose to multistratose leaf borders.

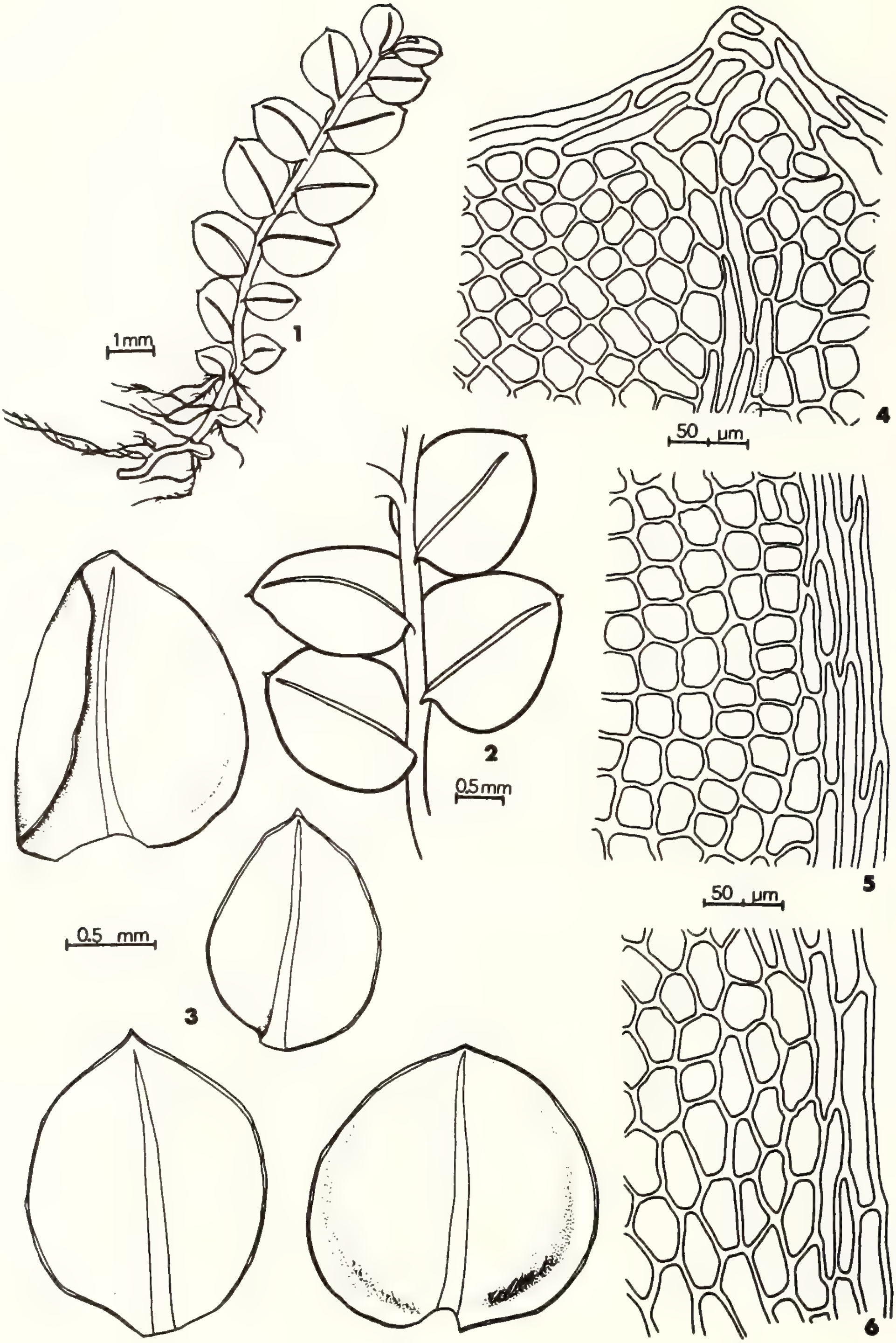
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Plate 198. *Cyrtomnium hymenophylloides*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.).

5. **Rhizomnium** (Broth.) Kop., Ann. Bot. Fenn. 5: 142. 1968.

Mnium sect. *Rhizomnium* Broth., Fl. Fenn. 1: 332. 1923.

Habit: In erect, loose tufts.

Colour: Green to reddish green.

Stems: 1–10 cm high, erect, simple or branching by innovations, rhizoids on lower part of stems, scattered or restricted to leaf axils.

Leaves: Erect to wide-spreading, contorted when dry, flat, unistratose, 2-several layers on margins, elliptic or obovate, broadly rounded, often apiculate, nondecurrent to shortly decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, bordered by 1-several rows of linear cells in 2-several layers, entire, often reddish.

Costae: Single, subpercurrent to percurrent, smooth, prominent on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, pitted or lacking pits. Median cells hexagonal to elongated, linear on margins, broad and rectangular near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, ovoid to ellipsoidal, straight, horizontal to pendulous, smooth.

Setae: Straight to somewhat flexuose, curved or hooked below capsule, smooth, not or little twisted when dry, reddish brown.

Annuli: Revoluble, deciduous, of 2–3 rows of cells.

Opercula: Conic to rostrate.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, yellowish or brownish yellow, endostome yellow to yellowish brown, 2–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 24–41 μm in longest dimension.

Koponen (1973) has recently studied the genus *Rhizomnium* in North America.

1. Leaves small, 3–6 mm long; costae subpercurrent; rhizoids restricted to leaf axils in lower part of stem . . . . 1. *R. punctatum*
1. Leaves large, 5–11 mm long; costae often percurrent; rhizoids scattered along lower part of stems 2
    2. Border cells of leaf bases quadrate to short-rectangular, often bearing rhizoids; leaf cells large, averaging 90 μm or more in longest dimension . . . . 2. *R. appalachianum*
    2. Border cells of leaf bases rectangular, lacking rhizoids; leaf cells smaller, averaging less than 90 μm in longest dimension . . . . 3. *R. magnifolium*

1. Rhizomnium punctatum (Hedw.) Kop., Ann. Bot. Fenn. 5: 143. 1968.

Mnium punctatum Hedw., Spec. Musc. 193. 1801.

[Synonym: *R. punctatum* ssp. *chlorophyllosum* (Kindb.) Kop.]

PLATE 199

Plants with small leaves, 3–6 mm long, subpercurrent costae and rhizoids on the stem that are restricted to the leaf axils.

Habitat: On soil, humus, rotten logs and stumps, bases of trees, boulders and cliffs, in woodlands often beside creeks.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Restigouche, Victoria, York); Nova Scotia (Colchester, Cumberland, Digby, Hants, Inverness, Kings, Lunenburg, Victoria); Prince Edward Island (Kings, Queens).

Range: Newfoundland to Ontario, south to *Georgia, Tennessee, and Arkansas; disjunct in western North America, occurring in *British Columbia and *Idaho. Europe, *Asia, *Africa.

Chromosome Number: n = 7.

2. **Rhizomnium appalachianum** Kop., Ann. Bot. Fenn. 10: 11. 1973.
[Synonym: *Mnium punctatum* var. *appalachianum* Crum & Anders.]
PLATE 200

Plants with large leaves, 5–11 mm long, usually percurrent costae and rhizoids scattered along stems. Close to *R. magnifolium* but with rhizoids or rhizoid initials (quadrate to short-rectangular cells) on the border cells of the leaf bases.

Habitat: On wet soil beside rivers or lakes, in cedar swamps and in depressions in woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Northumberland, Restigouche, Saint John, York); Nova Scotia (Annapolis, Cape Breton, Cumberland, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria, St. Paul Island); Prince Edward Island (Kings, Queens).

Range: Endemic to North America, occurring from Labrador to Manitoba, south to *Georgia, Tennessee, Michigan, Wisconsin, and Minnesota.

Chromosome Number: Unreported.

3. **Rhizomnium magnifolium** (Horik.) Kop., Ann. Bot. Fenn. 10: 14. 1973.
Mnium magnifolium Horik., J. Jap. Bot. 11: 503. 1935.
[Synonyms: *Mnium punctatum* var. *elatum* Schimp.; *R. perssonii* Kop.]
PLATE 201

Plants similar to *R. appalachianum* but differing in the longer rectangular border cells on the leaf bases that always lack rhizoids.

Habitat: On wet soil, often over rock, beside creeks and rivers or in depressions in woods.

Maritime Distribution: Frequent. New Brunswick (Albert, King's, Madawaska, Restigouche, Saint John, Victoria); Nova Scotia (Victoria); Prince Edward Island (Queens).

Range: In eastern North America from Greenland to Ontario, south to North Carolina and Michigan; in western North America from Alaska to Alberta, south to *California, Idaho, *Utah, and New Mexico. Europe, Asia.

Chromosome Number: n = 7.

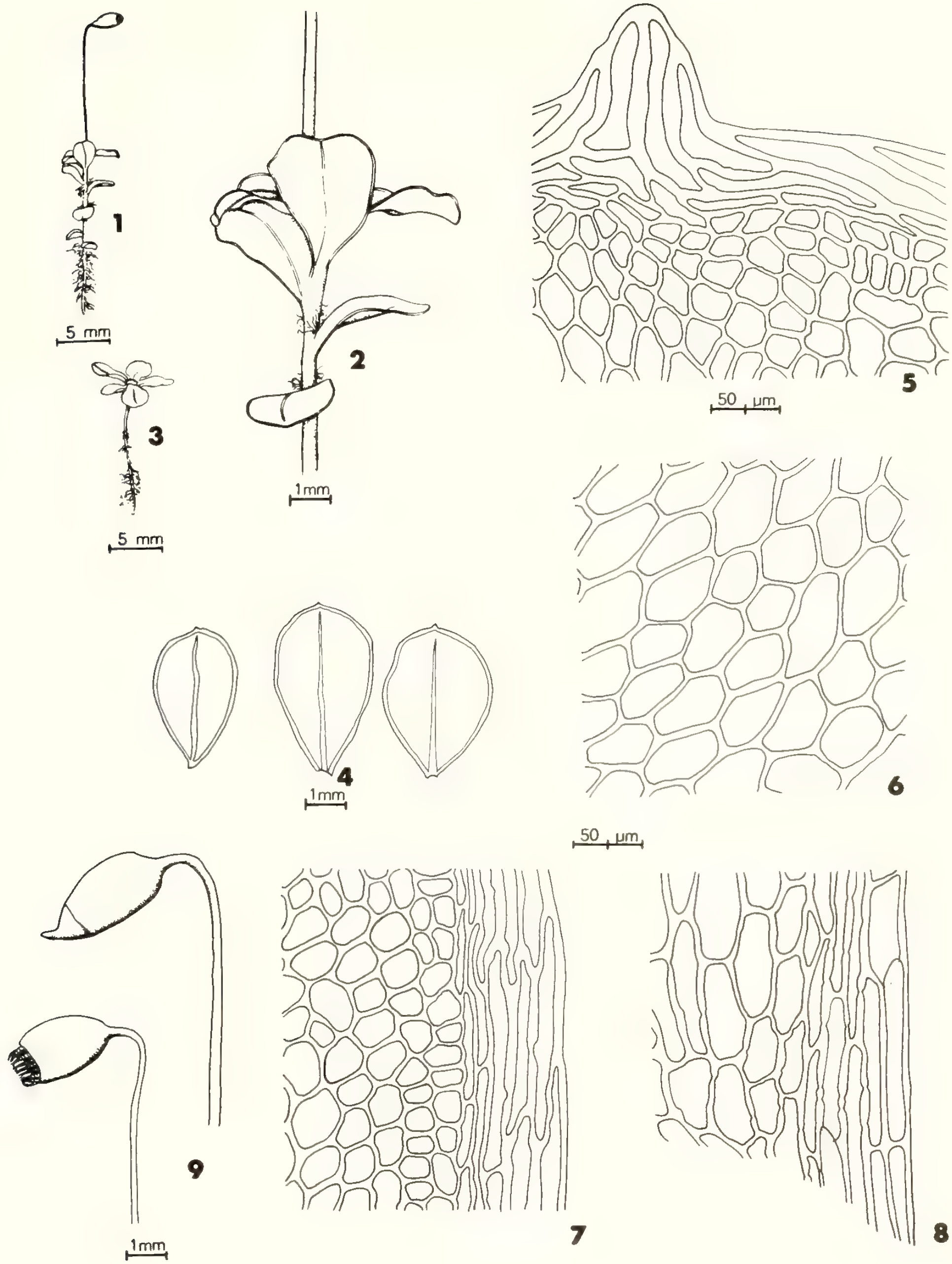
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Plate 199. *Rhizomnium punctatum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

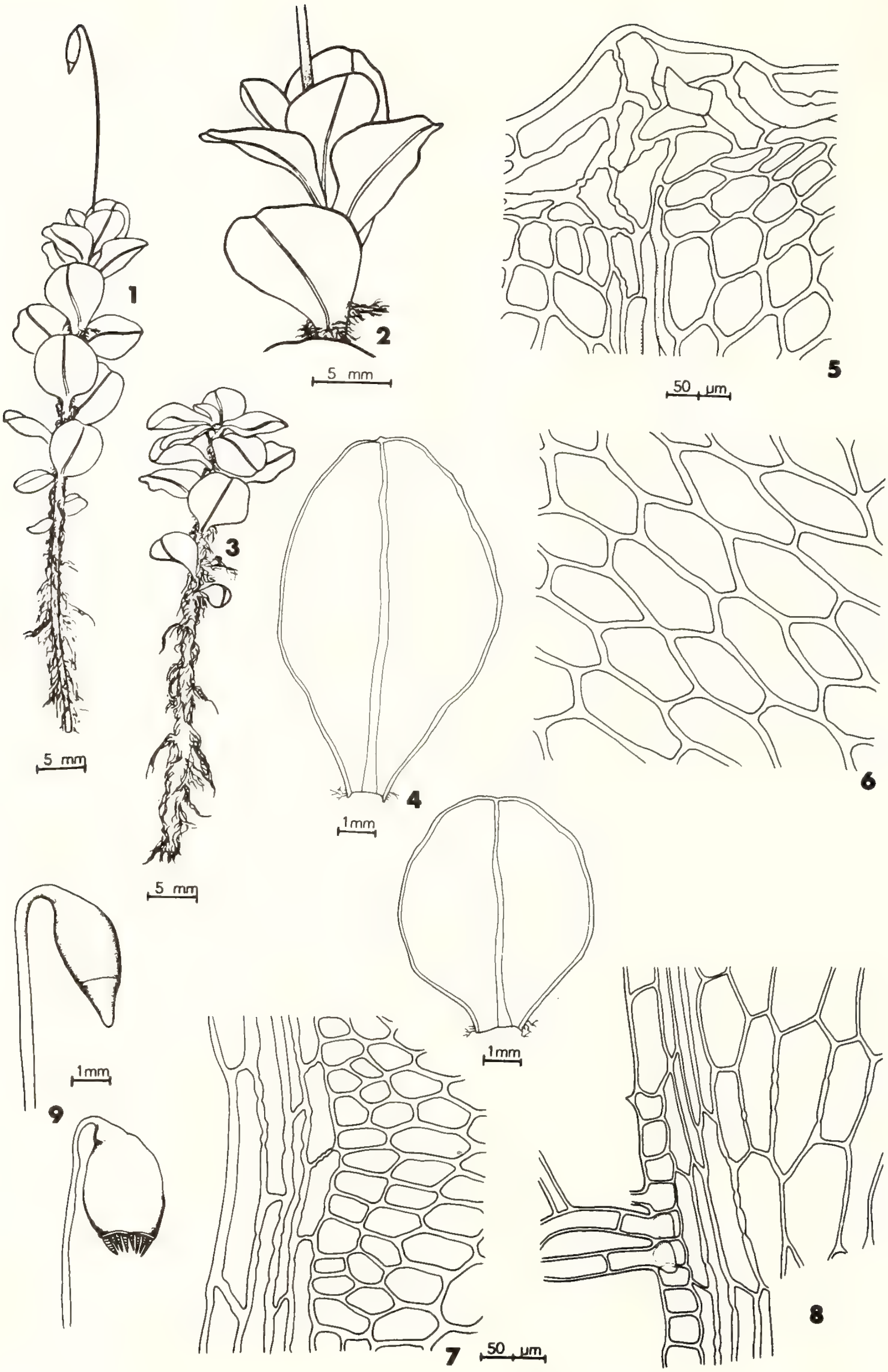
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Plate 200. *Rhizomnium appalachianum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6. median. 7, median-marginal. 8, alar, showing portion of rhizoids and quadrate rhizoid initial cells.). 9. Capsules, operculate (wet), inoperculate (dry).

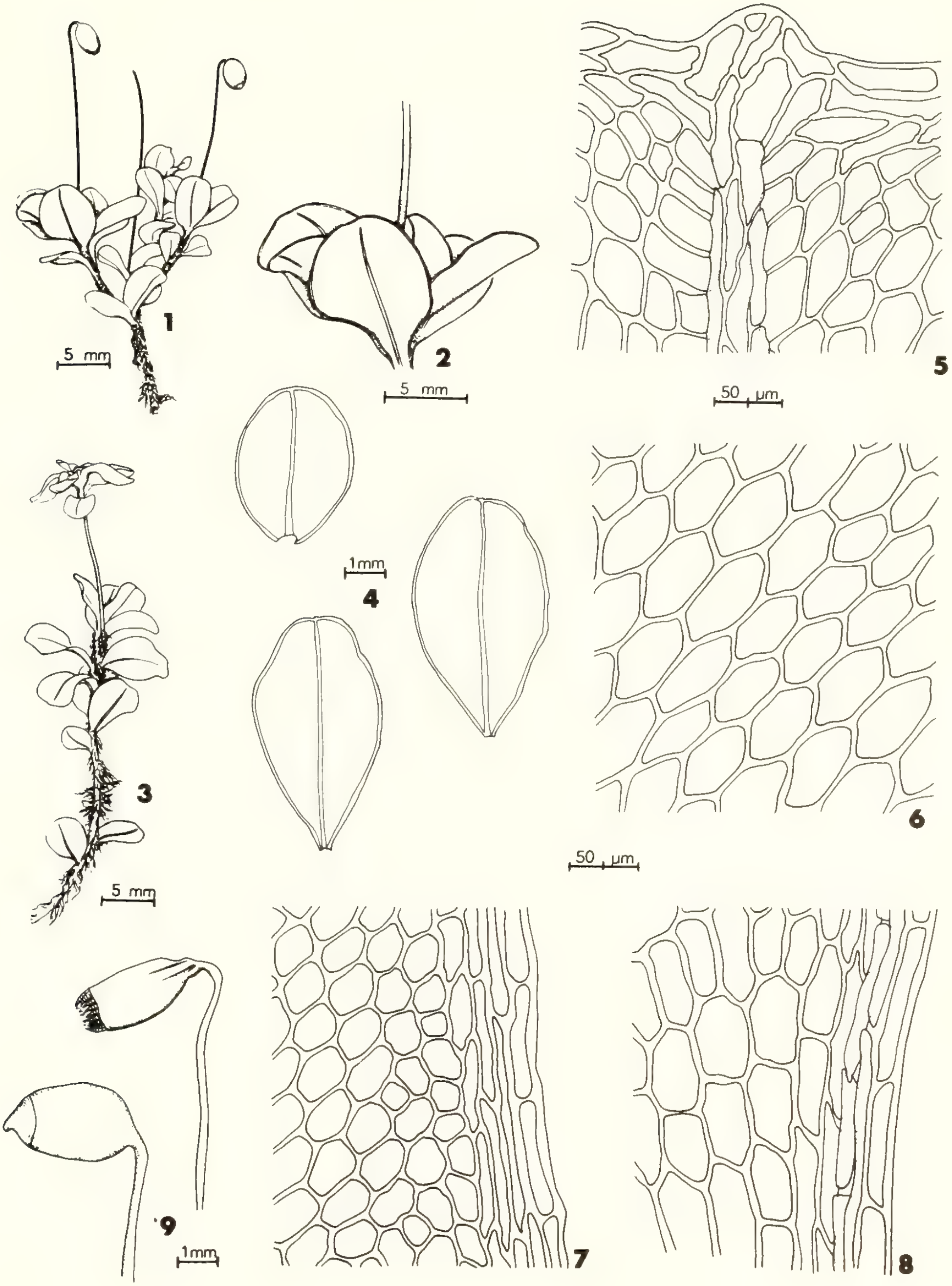
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Plate 201. *Rhizomnium magnifolium*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

Family AULACOMNIACEAE

Aulacomnium Schwaegr., Spec. Musc. Suppl. 3(1): 215. 1827. *nom. cons.*

Habit: In erect, loose to dense tufts.

Colour: Light green to yellowish green or yellowish brown, dull.

Stems: 0.5–8.0 cm high, simple or forked, rhizoids often extending to near apex.

Leaves: Erect to erect-spreading, usually contorted when dry, sometimes little changed, concave or keeled, unistratose, oblong, lanceolate or ovate, acute to obtuse, not or shortly decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or recurved to revolute from base to near leaf middle, entire or serrate above.

Costae: Single, subpercurrent, prominent on dorsal surface.

Leaf Cells: Unipapillose or sometimes smooth, thick-walled. Median cells irregularly rounded to oblong or elliptic, becoming elongate near base.

Asexual Reproductive Bodies: Lacking or occurring at apices on pseudopodia in round clusters of fusiform gemmae or in elongated clusters of ecostate, leaf-like gemmae.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown, yellowish brown or reddish brown, cylindric, straight to arcuate, suberect to horizontal, contracted below mouth and strongly ribbed when dry.

Setae: Straight to somewhat flexuose, smooth, not or little twisted when dry, brown, yellowish brown to reddish brown.

Annuli: Revoluble, deciduous, of 2–3 rows of cells.

Opercula: Conic to rostrate.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, yellowish brown, endostome hyaline, 2–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose, smooth to minutely papillose, 7–17 μm.

1. Leaves broadly oblong to ovate, coarsely serrate above; autoicous .... 1. *A. heterostichum*
1. Leaves lanceolate to oblong-lanceolate, entire to serrulate; dioicous 2
    2. Small plants bearing pseudopodia with round clusters of fusiform gemmae only at the apices; often in dry habitats .... 2. *A. androgynum*
    2. Medium-sized to robust plants bearing pseudopodia with ecostate, leaf-like gemmae clustered at the apices and sparsely scattered below; usually in bogs or other wet habitats .... 3. *A. palustre*

1. Aulacomnium heterostichum (Hedw.) B.S.G., Bryol. Eur. 4: 215. 403. 1841 (fasc. 10 Mon. 7.1).
Arrhenopterum heterostichum Hedw., Spec. Musc. 198. 1801.
PLATE 202

Plants autoicous, with broad, oblong to ovate leaves that are coarsely serrate on the upper half of the margins. Pseudopodia are normally lacking but they are present on the other Maritime species.

Habitat: On humus on banks in woods.

Maritime Distribution: Rare. Nova Scotia (Colchester, Hants).

Range: Occurring in eastern North America, from Nova Scotia and Ontario, south to the Gulf States. Asia.

Chromosome Number: n = 11, 12.

2. Aulacomnium androgynum (Hedw.) Schwaegr., Spec. Musc. Suppl. 3(1): 215. 1827.
Bryum androgynum Hedw., Spec. Musc. 178. 1801.
PLATE 203

Plants small, dioicous, with narrow, lanceolate to oblong-lanceolate leaves that are entire to serrulate on the upper half of the margins. Pseudopodia are often present and fusiform gemmae occur only at their apices in round clusters.

Habitat: On soil or humus in woodlands, often over rock, sometimes on decaying wood, generally in dry habitats.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Westmorland); Nova Scotia (Annapolis, Digby, Guysborough, Halifax, Hants, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Labrador to Alaska, south to West Virginia, Michigan, Wisconsin, Minnesota, Wyoming, Idaho, and California. Europe, Asia, *Africa, *South America.

Chromosome Number: n = 12.

3. Aulacomnium palustre (Hedw.) Schwaegr., Spec. Musc. Suppl. 3(1): 216. 1827.
Mnium palustre Hedw., Spec. Musc. 188. 1801.
PLATE 204

Plants medium-sized to robust, dioicous, with narrow to broad, lanceolate to oblong-lanceolate leaves that are entire to serrulate on the upper half of the margins. Several rows of cells at the leaf insertion are enlarged, swollen and often brownish. Pseudopodia that bear ecostate, leaf-like gemmae in elongated clusters at their apices and sparsely scattered below are often present.

Habitat: On soil or humus, sometimes on rotting logs, often in bogs, in swamps, at lake margins, beside streams or in other wet habitats.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, Northumberland, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Inverness, Kings, Lunenburg, Queens, Richmond, Shelburne, Victoria, Yarmouth, Sable Island, Saint Paul Island); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to the Gulf States, Colorado, Utah, Nevada, and California. Europe, Asia, *Africa, *South America, Australia, New Zealand.

Chromosome Number: n = 12.

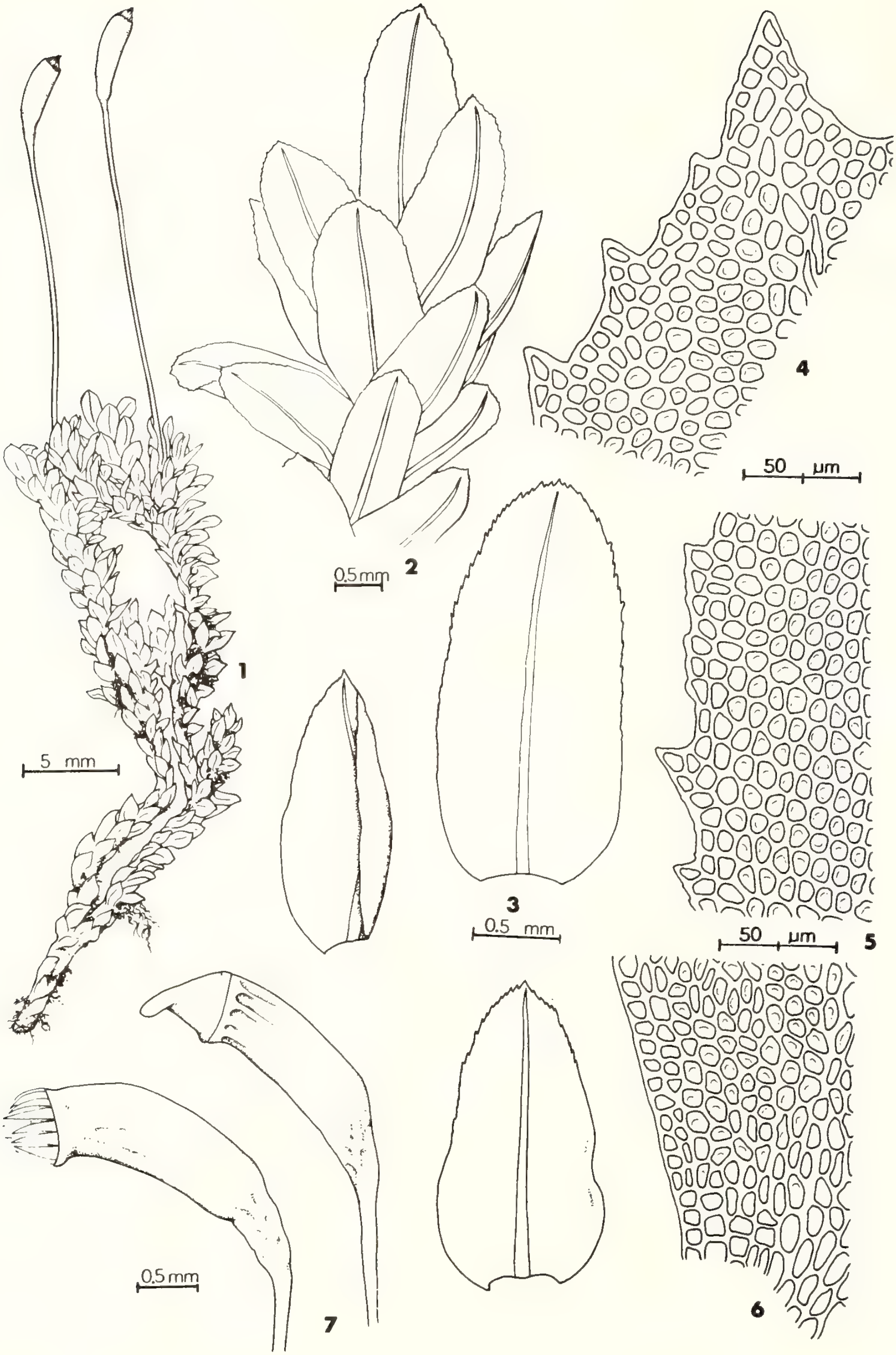
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Plate 202. *Aulacomnium heterostichum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry).

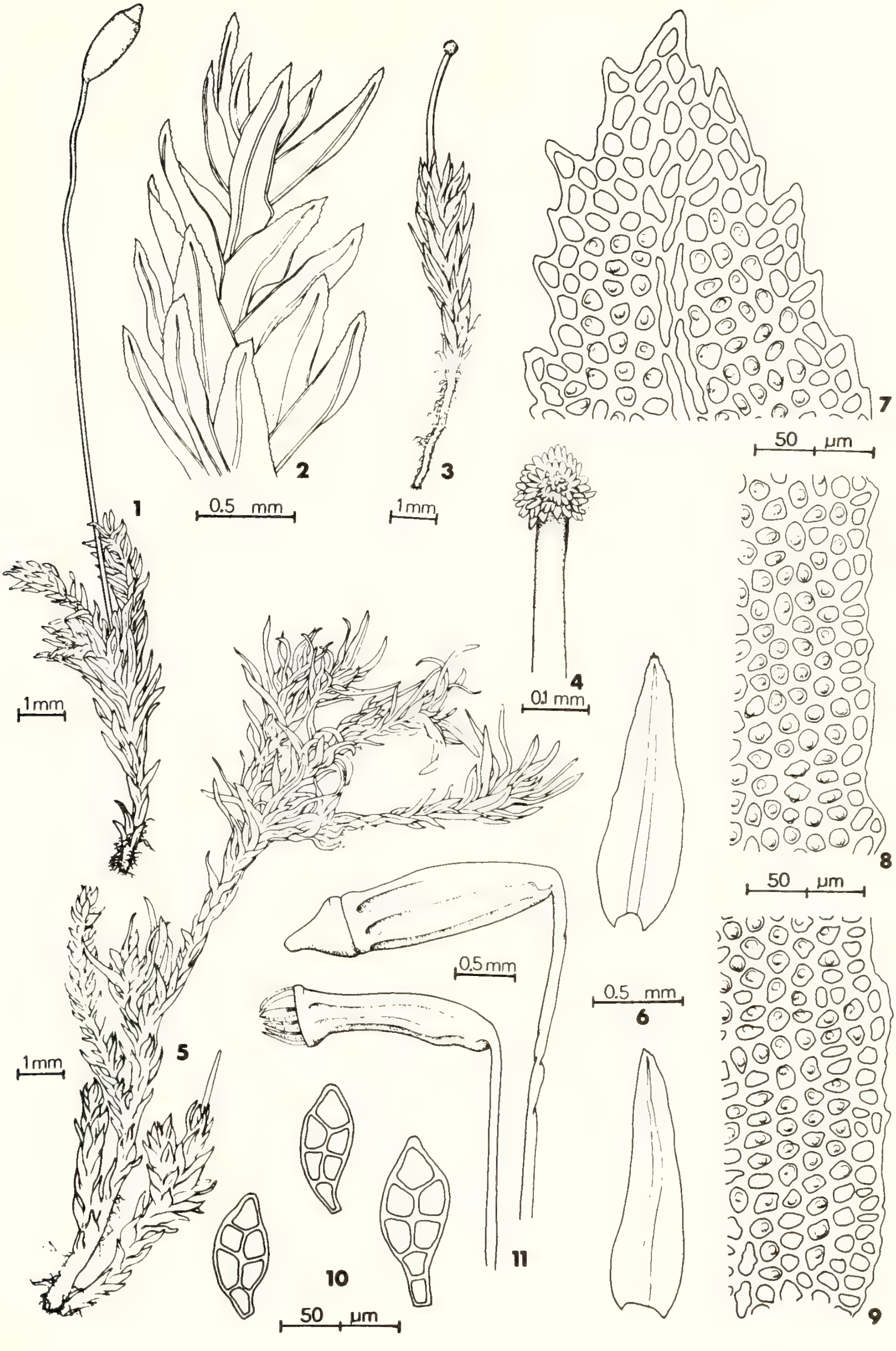
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Plate 203. *Aulacomnium androgynum*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of gemmiferous plant. 4. Upper portion of pseudopodium bearing gemmae. 5. Male plant. 6. Leaves. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Gemmae. 11. Capsules (dry).

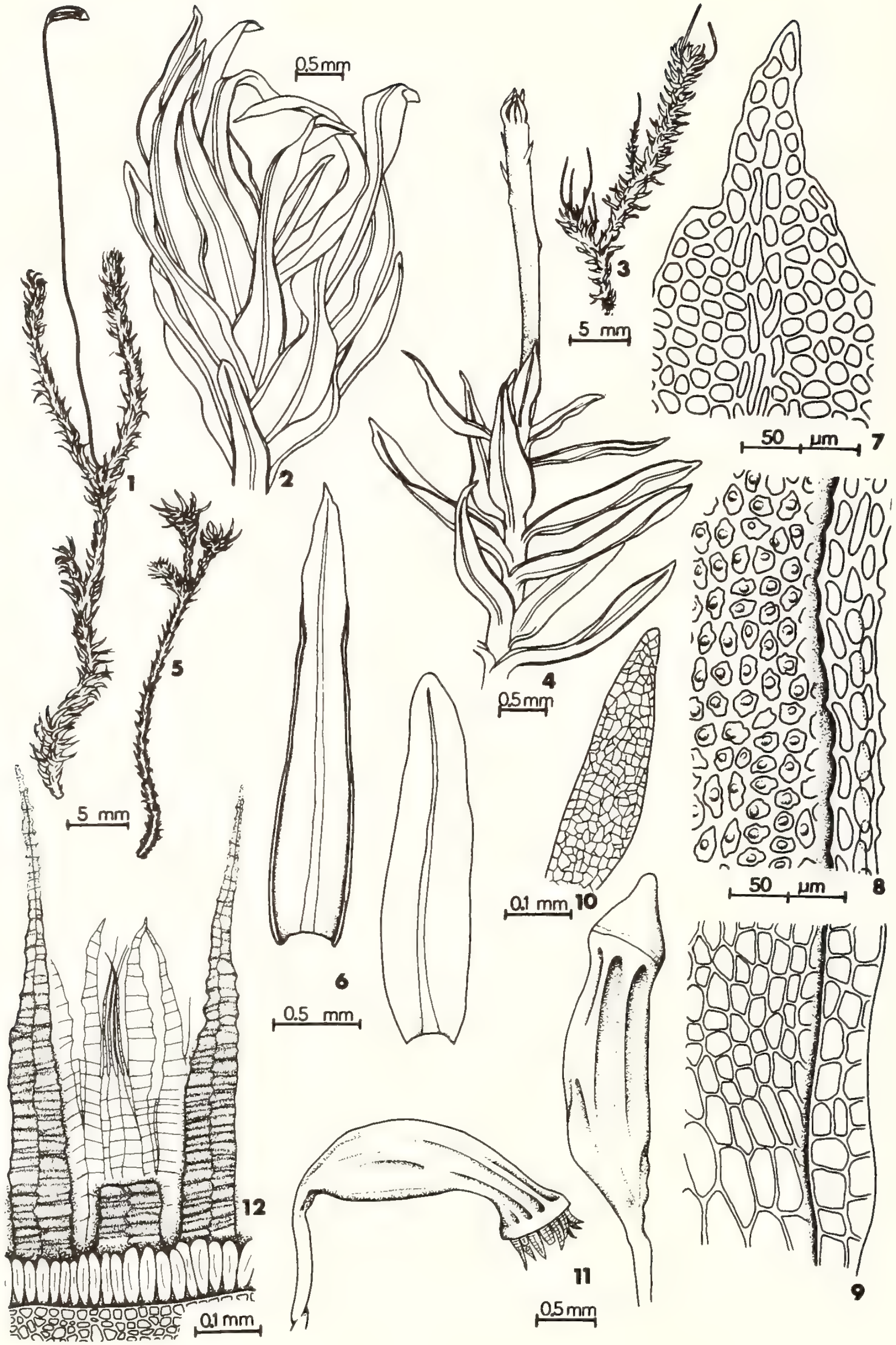
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Plate 204. *Aulacomnium palustre*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of gemmiferous plant. 4. Portion of stem of gemmiferous plant with pseudopodium bearing gemmae. 5. Male plant. 6. Leaves. 7–9. Leaf cells (7, apical. 8, median-marginal. 9, alar.). 10. Gemma. 11. Capsules (dry). 12. Peristome teeth.

Family MEESIACEAE

1.	Leaves strongly squarrose-recurved; leaf cells unipapillose	1. *Paludella* (p. 363)
1.	Leaves erect to squarrose; leaf cells smooth	2. *Meesia* (p. 365)

1. **Paludella** Brid., Spec. Musc. 3: 72. 1817.

Habit: In erect, dense tufts.

Colour: Light green to yellowish green above, brown to reddish brown below, dull.

Stems: 4–10 cm high, erect, simple or sometimes forked, densely tomentose nearly to apex with reddish brown rhizoids.

Leaves: 5-ranked, strongly squarrose-recurved, little changed when dry, keeled, unistratose, obovate, acute, long-decurrent. Perichaetial leaves slightly longer and narrower.

Leaf Margins: Broadly recurved to near middle of leaf, serrate to serrulate above, entire below.

Costae: Single, subpercurrent, toothed on dorsal surface near apex, somewhat prominent on dorsal surface.

Leaf Cells: Unipapillose, the walls thick, lacking pits. Median cells hexagonal, irregularly angled or rounded, elongate and smooth on margins, rectangular, smooth and much longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, brown, subcylindric, constricted to a short neck, curved above erect neck, erect to inclined, smooth, wrinkled at neck when dry.

Setae: Long, straight to flexuose, erect, smooth, not or little twisted when dry, brown or reddish brown.

Annuli: Revoluble, deciduous, of 1–2 rows of cells.

Opercula: Convex or conic.

Peristomes: Double, 16 exostome teeth, lanceolate, yellowish brown, endostome hyaline, from a low basal membrane, cilia lacking, sometimes rudimentary.

Spores: Yellow to brown, globose, minutely papillose, 14–19 μm

1. Paludella squarrosa (Hedw.) Brid., Musc. Rec. Suppl. 3: 72. 1817.

Bryum squarrosum Hedw., Spec. Musc. 186. 1801.

PLATE 205

Plants with densely tomentose stems, 4–10 cm high, leaves 5-ranked, strongly squarrose-recurved, obovate, keeled, acute, sharply serrate on the upper half of the margins and with unipapillose leaf cells. Not known with sporophytes from the Maritimes.

Habitat: In calcareous fen.

Maritime Distribution: Rare. Nova Scotia (Victoria). Known from a specimen collected at Big Baddeck, *W.B. Schofield 6114* (CANM 149096), 5 September 1955.

Range: Greenland to Alaska, south to New York, Michigan, and Montana. Europe, *Asia, *Africa.

Chromosome Number: n = 10.

Remarks: An extremely distinct and easily recognized species of a monotypic genus. Capsules drawn from Labrador plants.

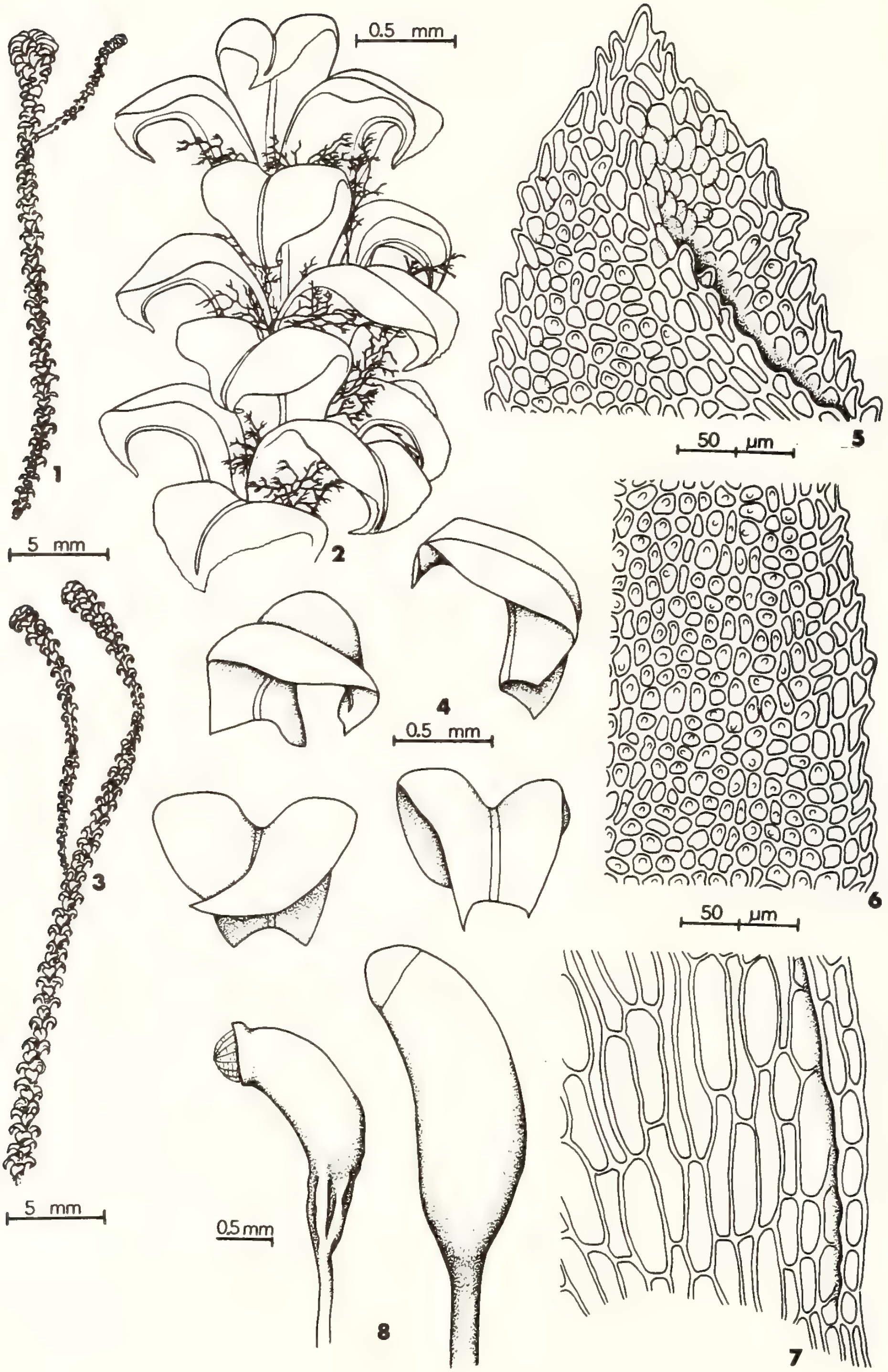
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Plate 205. *Paludella squarrosa*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

2. **Meesia** Hedw., Spec. Musc. 173. 1801. *nom. cons.*

Habit: In erect, loose to dense tufts.

Colour: Green to yellowish green, brown below, glossy to dull.

Stems: 1–6 cm high, erect, simple or sometimes forked, densely tomentose below with reddish brown rhizoids.

Leaves: Erect to squarrose, sometimes 3-ranked, contorted when dry, concave to keeled, unistratose, linear to ovate-lanceolate, acute to obtuse, decurrent or nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or revolute, entire or serrulate to serrate nearly to base.

Costae: Single, subpercurrent, smooth, prominent on dorsal surface.

Leaf Cells: Smooth, the walls medium to thick, lacking pits. Median cells hexagonal, irregularly angled, rounded or rectangular, rectangular and larger near base.

Asexual Reproductive Bodies: Lacking.

Sex: Polygamous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellowish brown to brown, elongate-pyriform, constricted to a short neck, curved above erect neck, erect, smooth, wrinkled at neck when dry.

Setae: Very long, straight to flexuose, smooth, not or little twisted when dry, yellowish brown to reddish brown.

Annuli: Lacking or poorly differentiated and persistent.

Opercula: Convex to conic.

Peristomes: Double, 16 exostome teeth, truncate, yellowish brown to brown, about $^1/_3$ the length of the endostome, from a low basal membrane, cilia 2–4, rudimentary.

Spores: Yellowish green to brown, globose, minutely papillose, 31–51 μm.

1. Plants small, stems less than 3 cm high, leaves not 3-ranked, linear, obtuse, margins entire . . . . 1. *M. uliginosa*
1. Plants large, stems often over 3 cm high, leaves 3-ranked, ovate-lanceolate, acute, margins serrate nearly to base . . . . 2. *M. triquetra*

1. **Meesia uliginosa** Hedw., Spec. Musc. 173. 1801.
[Synonym: *M. trichodes* Spruce]
PLATE 206

The linear leaves with obtuse apices and entire margins will distinguish this species from *M. triquetra*.

Habitat: In boggy places. A calciphile often growing on soil or humus in fens or swampy forests.

Maritime Distribution: Rare. Nova Scotia (Colchester). Collected once at Truro by *J. Macoun*, 12 June 1884.

Range: Greenland to Alaska, south to New York, Michigan, Montana, and California. Europe, *Asia.

Chromosome Number: n = 13, 14, 15.

2. **Meesia triquetra** (Richt.) Ångstr., Nov. Act. Roy. Soc. Sci. Upsal. 12: 357. 1844.
Mnium triquetrum Richt., Codex Bot. Linn. 1045. 1840.
[Synonyms: *M. trifaria* Crum, Steere & Anders.; *M. tristicha* Bruch]
PLATE 207

Easily distinguished from *M. uliginosa* by the 3-ranked leaves that are ovate-lanceolate with acute apices and serrated margins.

Habitat: In calcareous swampy woods.

Maritime Distribution: Rare. New Brunswick (Gloucester, Queen's, Victoria).

Range: Greenland to Alaska, south to New Jersey, *Ohio, Michigan, Minnesota, and California. Europe, *Asia, *Australia.

Chromosome Number: n = 10.

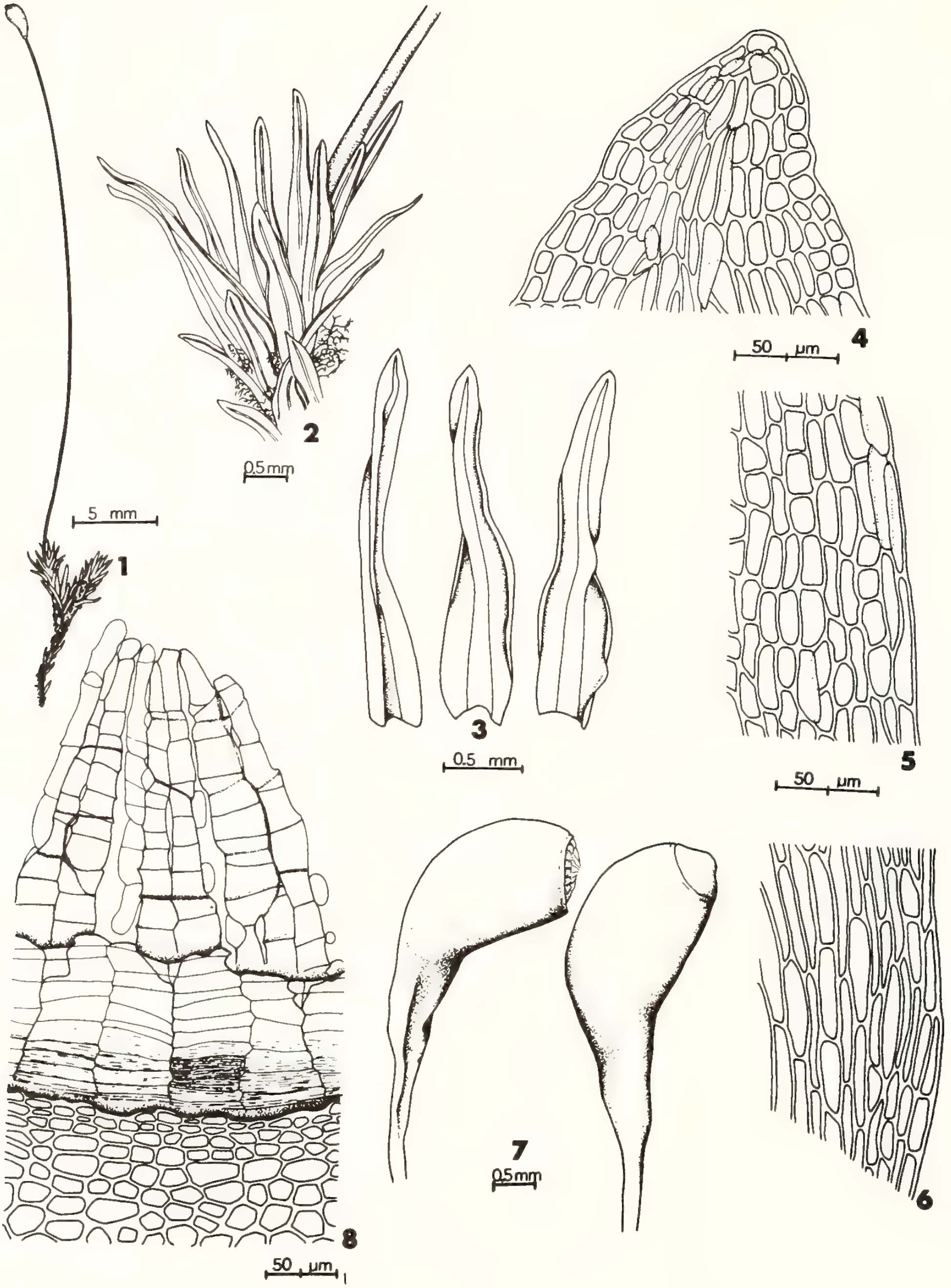
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Plate 206. *Meesia uliginosa*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules, operculate (wet), inoperculate (dry). 8. Peristome teeth.

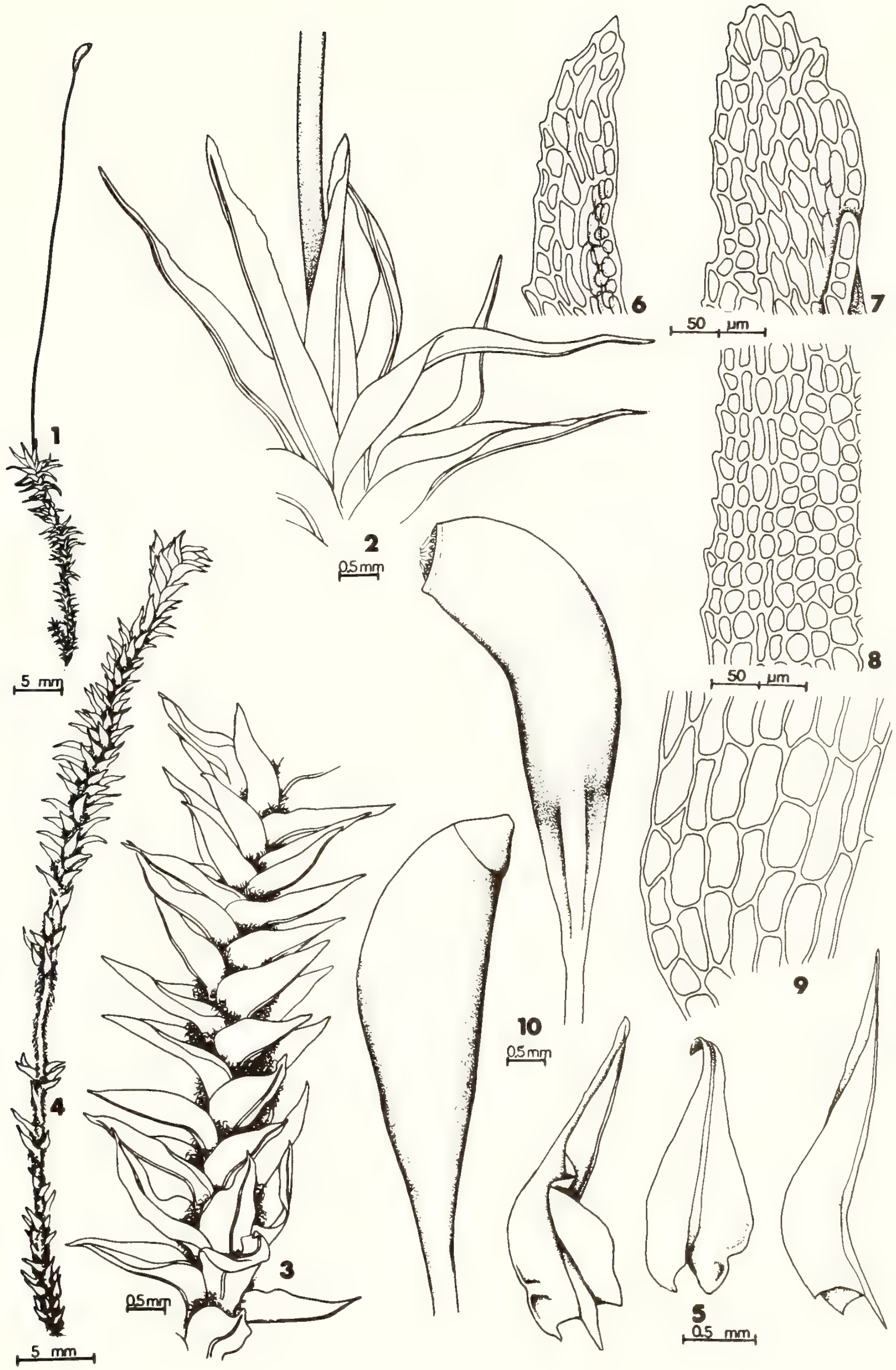
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Plate 207. *Meesia triquetra*. 1. Habit. 2. Upper portion of stem. 3. Middle portion of stem. 4. Male plant. 5. Leaves. 6–9. Leaf cells (6–7, apical. 8, median-marginal. 9, alar.). 10. Capsules, operculate (wet), inoperculate (dry).

Family CATOSCOPIACEAE

Catoscopium Brid., Bryol. Univ. 1: 388. 1826.

Habit: In erect, loose to dense tufts.

Colour: Yellowish green to blackish green, glossy.

Stems: 1-3 cm high, erect, forked or sometimes simple, rhizoids near base.

Leaves: Erect-spreading, somewhat contorted when dry, keeled, unistratose, lanceolate, acuminate, non-decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or recurved below, entire.

Costae: Single, subpercurrent, prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick, lacking pits. Median cells rectangular, becoming longer and wider near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish throughout, fugacious or reported to sometimes adhere to tip of setae.

Capsules: Solitary, on a seta arising from stem apex, reddish brown to black, ovoid, strongly arcuate, inclined to horizontal, smooth, mouth directed downward, stomata lacking.

Setae: Straight, smooth, not or little twisted when dry, brown to reddish brown.

Annuli: Lacking.

Opercula: Convex-apiculate.

Peristomes: Single or double, 16 exostome teeth, lanceolate, yellowish, endostome sometimes present, hyaline, rudimentary, cilia lacking.

Spores: Yellow to yellowish brown, globose to ellipsoidal, minutely papillose, 28–47 μm in longest dimension.

1. **Catoscopium nigritum** (Hedw.) Brid., Bryol. Univ. 1: 368. 1826.
Weissia nigrita Hedw., Spec. Musc. 72. 1801.
PLATE 208

Distinctive plants with small capsules, 0.5–1.0 mm long, reddish brown to black, smooth, ovoid, strongly arcuate, mouth directed downward, leaves lanceolate, acuminate, erect-spreading, yellowish green to blackish green, and costae subpercurrent.

Habitat: On soil over calcareous ledges in canyon.

Maritime Distribution: Rare. New Brunswick (Victoria). The only known locality is at Grand Falls.

Range: Greenland to Alaska, south to New Brunswick, Michigan, Iowa, *Montana, and British Columbia. Europe, *Asia.

Chromosome Number: n = 13, 14.

Remarks: Commonly called the "Golf Club Moss" because of the peculiar capsules. Sterile plants remind one of *Ceratodon* but the leaves are shiny and lack the purple pigmentation.

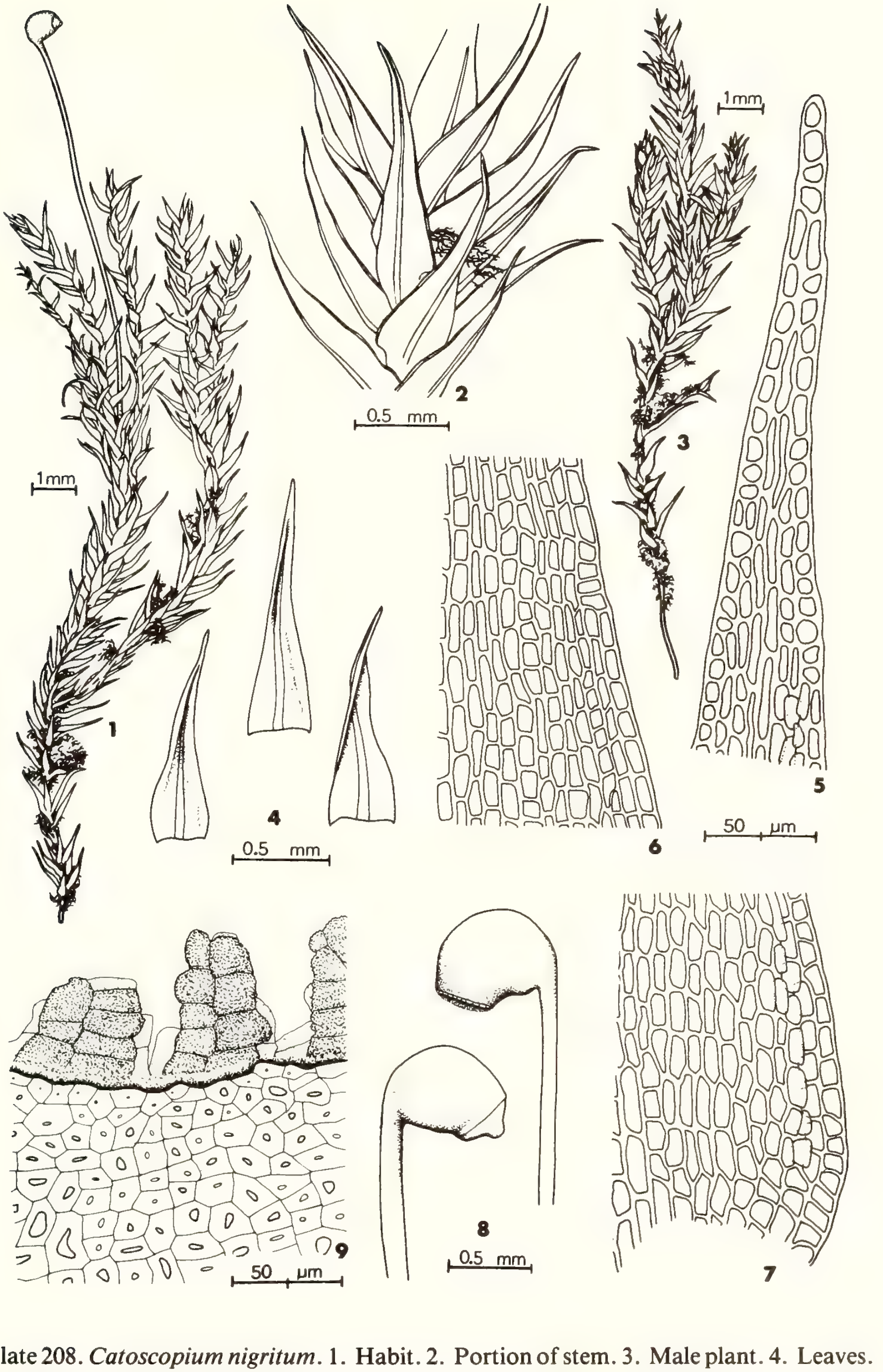
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Plate 208. *Catoscopium nigritum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Peristome teeth.

Family BARTRAMIACEAE

1. Leaf cells minutely multipapillose; stems triangular in cross-section ...... 1. *Plagiopus* (p. 370)
1. Leaf cells strongly unipapillose; stems round in cross-section 2
    2. Leaves linear-lanceolate from a sheathing base; leaf margins partly bistratose above .... 2. *Bartramia* (p. 372)
    2. Leaves lanceolate to ovate-lanceolate and not sheathing at base; leaf margins unistratose .... 3. *Philonotis* (p. 374)

1. Plagiopus Brid., Bryol. Univ. 1: 596. 1826.

Habit: In erect, loose to dense tufts.

Colour: Green to yellowish green above, brown below, dull.

Stems: 2–7 cm high, erect, forked or sometimes simple, triangular in cross-section, reddish brown, papillose rhizoids at base and often among leaves.

Leaves: Erect to erect-spreading, slightly crisped and contorted when dry, concave below, keeled above, unistratose or sometimes bistratose above on margins, lanceolate, acuminate, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Revolute from base to near apex, doubly serrate above, entire below, often bistratose above.

Costae: Single, percurrent to shortly excurrent, prominent on dorsal surface, toothed on dorsal surface near apex.

Leaf Cells: Multipapillose with minute, elongate papillae often appearing as striations, smooth or nearly so at apex, the walls thick, lacking pits. Median cells quadrate to rectangular, becoming longer and wider at base.

Asexual Reproductive Bodies: Lacking.

Sex: Synoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex or at juncture of branch below apex, brown or reddish brown, globose, arcuate, inclined to horizontal, furrowed when dry.

Setae: Straight to flexuose, smooth, not twisted when dry, brown or reddish brown.

Annuli: Lacking.

Opercula: Convex or conic.

Peristomes: Double, 16 exostome teeth, lanceolate, brown to reddish brown, endostome light brown to yellowish brown, cilia lacking or short and rudimentary.

Spores: Yellow to yellowish brown, globose to ellipsoidal, roughly papillose, 15–27 μm in longest dimension.

1. Plagiopus oederiana (Brid.) Limpr., Laubm. Deutschl. 2: 548. 1893.
Bartramia oederi Brid., Musc. Rec. 2(3): 135. 1803.
PLATE 209

Plants closely resembling *Bartramia pomiformis* but the stems are triangular in cross-section, the leaves are shorter (2–4 mm), scarcely crisped and contorted when dry, the margins are revolute from the base to near the apex, and the leaf cells are covered with numerous, minute, elongate papillae or striations.

Habitat: On calcareous rock, often on bluffs beside streams.

Maritime Distribution: Common. New Brunswick (Albert, Restigouche, Saint John, Victoria); Nova Scotia (Colchester, Cumberland, Inverness, Kings, Victoria).

Range: Greenland to Alaska, south to Virginia, Michigan, Iowa, Colorado, Idaho, and *Oregon. *South America, Europe, Asia

Chromosome Number: n = 7, 8.

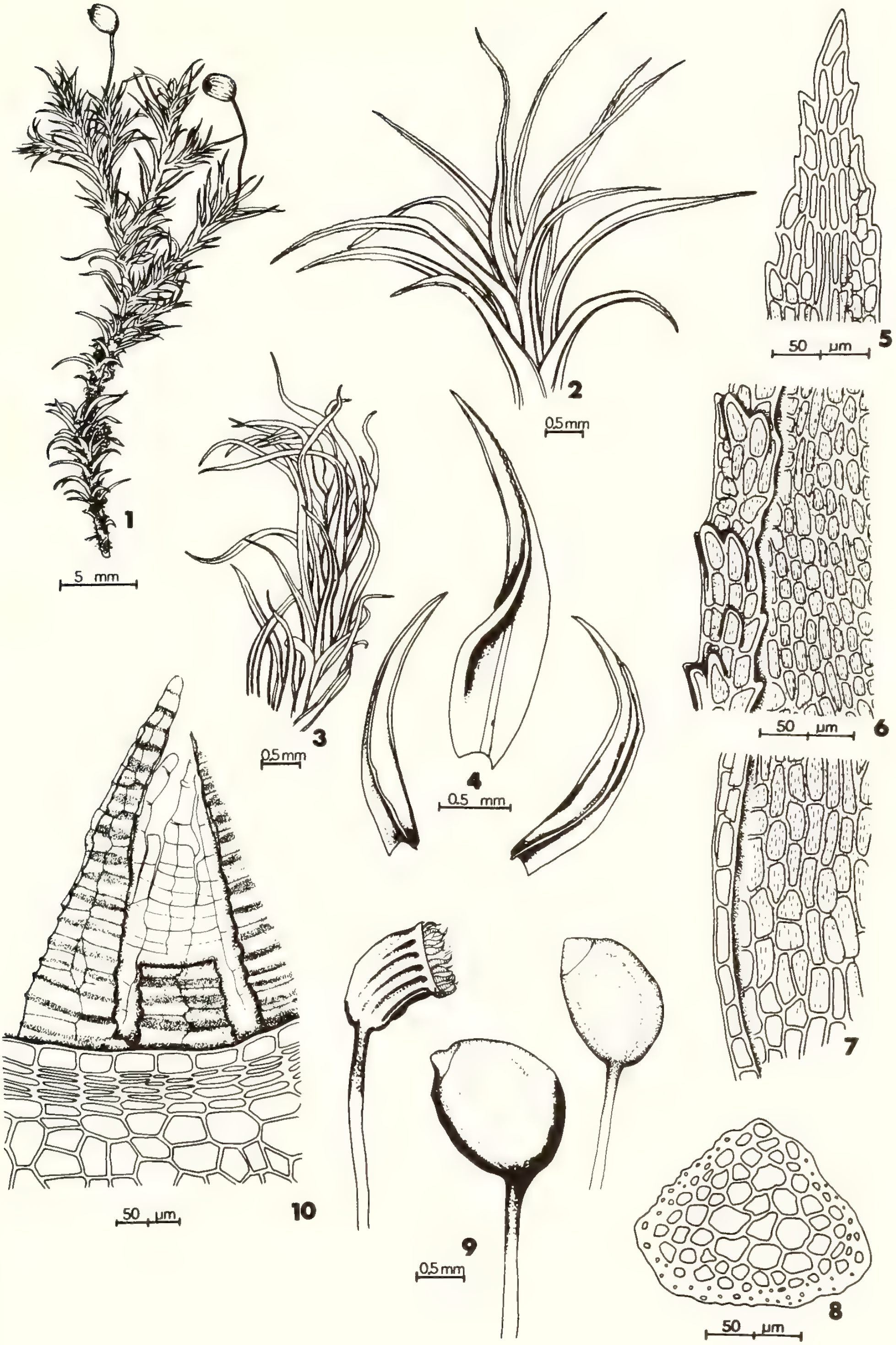
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Plate 209. *Plagiopus oederiana*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of stem. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

2. **Bartramia** Hedw., Spec. Musc. 164. 1801. *nom. cons.*

Habit: In erect, usually dense tufts.

Colour: Light green to yellowish green above, brown below, dull.

Stems: 2–6 cm high, erect, forked or sometimes simple, nearly round in cross-section, reddish brown, papillose rhizoids at base and often among leaves.

Leaves: Erect to erect-spreading, strongly crisped and contorted when dry, concave below, keeled above, unistratose or bistratose above on margins, linear-lanceolate, acuminate, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Recurved to revolute from base to middle or above, doubly serrate above, entire below, bistratose above.

Costae: Single, shortly excurrent, prominent on dorsal surface, toothed on dorsal surface near apex.

Leaf Cells: Unipapillose on both surfaces with nearly round papillae, smooth near base, the walls thick, lacking pits. Median cells quadrate to rectangular, becoming longer and wider at base.

Asexual Reproductive Bodies: Lacking.

Sex: Synoicous or autoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex or at juncture of branch below apex, brown or reddish brown, globose, arcuate, inclined to horizontal, furrowed when dry.

Setae: Straight to somewhat flexuose, smooth, not twisted when dry, brown or reddish brown.

Annuli: Lacking.

Opercula: Convex:

Peristomes: Double, 16 exostome teeth, lanceolate, brown to reddish brown, endostome yellow to orange, cilia lacking or short and rudimentary.

Spores: Yellow to yellowish brown, globose to ellipsoidal, roughly papillose, 19–24 μm in longest dimension.

1. **Bartramia pomiformis** Hedw., Spec. Musc. 164. 1801.

PLATE 210

Plants 2–6 cm high, in dense tufts, light green or yellowish green, leaves linear-lanceolate, 3–6 mm long, strongly crisped when dry, margins recurved to revolute in lower half, doubly serrate, cells unipapillose on both surfaces; capsules globose, deeply furrowed when dry.

Habitat: On soil or humus over boulders, on cliff ledges or in cliff crevices, often along streams.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria).

Range: Greenland to Alaska, south to Georgia, Alabama, Arkansas, Oklahoma, Montana, and Oregon. *South America, Europe, Asia, Africa, Australia.

Chromosome Number: n = 8, 9.

Remarks: Commonly called the "Apple Moss" because of the globose capsules.

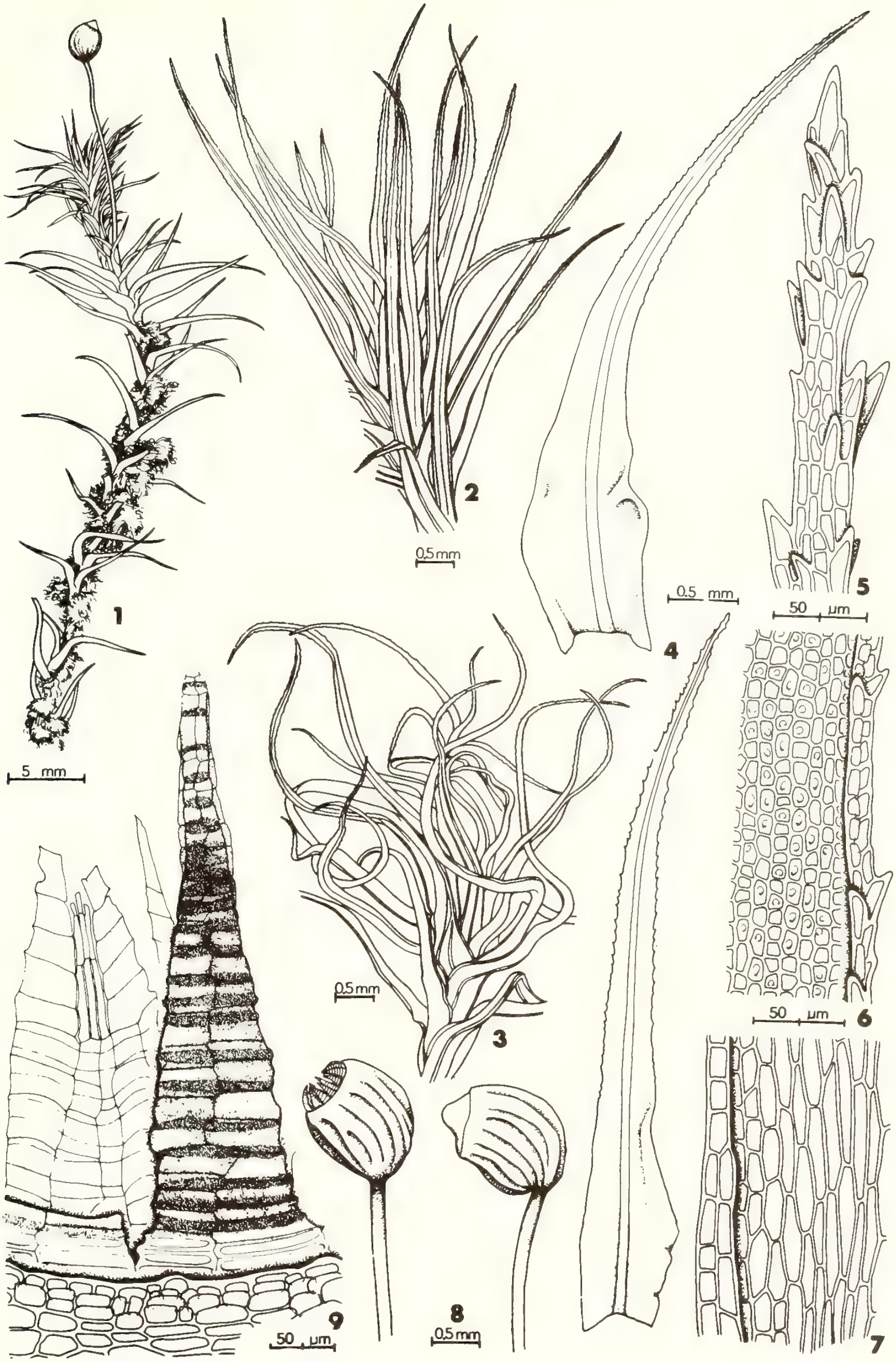
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Plate 210. *Bartramia pomiformis*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Peristome teeth.

3. **Philonotis** Brid., Bryol. Univ. 2: 15. 1827.

Habit: In erect, usually dense tufts.
Colour: Whitish green to yellowish green, dull to glossy.
Stems: 2–10 cm high, erect, forked or often with whorls of branches below inflorescences, round in cross-section, reddish brown, smooth rhizoids at base and among leaves.
Leaves: Erect to spreading, little changed when dry or sometimes apices twisted and turned to one side, concave to weakly keeled, unistratose, lanceolate to ovate-lanceolate, acute to acuminate, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane or revolute from base to middle or above, singly or doubly serrate (adjacent ends of marginal cells forming a pair of projections) nearly to base.
Costae: Single, percurrent to shortly excurrent, prominent on dorsal surface, smooth.
Leaf Cells: Papillose, a single, nearly round papilla at end of cells or one at upper end on ventral surface and one at lower end on dorsal surface.
Asexual Reproductive Bodies: Deciduous brood branches occasionally present in axils of upper leaves.
Sex: Dioicous.
Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.
Capsules: Solitary, on a seta arising from stem apex or at juncture of branch below apex, brown or reddish brown, subglobose, arcuate, inclined to horizontal, furrowed when dry.
Setae: Straight to flexuose, smooth, slightly twisted when dry, brown or reddish brown.
Annuli: Lacking.
Opercula: Convex or conic.
Peristomes: Double, 16 exostome teeth, lanceolate, brown to reddish brown, yellow to orange, cilia 2–3, sometimes rudimentary.
Spores: Yellow to yellowish brown, globose to ellipsoidal, roughly papillose, 19–31 μm in longest dimension.

"Fountain Apple Moss" is the common name sometimes applied to members of the genus *Philonotis*.

1. Leaves lanceolate, margins singly serrate, upper cells papillose at upper ends .... 1. *P. marchica*
1. Leaves ovate-lanceolate, margins singly or doubly serrate (adjacent ends of marginal cells forming a pair of projections), upper cells papillose at lower ends, sometimes at upper or both ends 2
    2. Leaf apices twisted and turned to one side when dry .... 2a. *P. fontana* var. *americana*
    2. Leaf apices straight or twisted but, if twisted, not turned to one side when dry 3
        3. Costae percurrent to short-excurrent .... 2. *P. fontana*
        3. Costae long-excurrent .... 2b. *P. fontana* var. *pumila*

1. Philonotis marchica (Hedw.) Brid., Bryol. Univ. 2: 23. 1827.
Mnium marchicum Hedw., Spec. Musc. 196. 1801.
PLATE 211

Differing from the others in the genus by the lanceolate leaves with singly serrate margins and the upper leaf cells that are papillose only at the upper ends.
Habitat: On soil over rock in wet, shady habitats.
Maritime Distribution: Rare. Nova Scotia (Annapolis, Cape Breton, Inverness, Kings).
Range: *Newfoundland to Ontario, south to North Carolina, Tennessee, Arkansas, and Texas; in the West from British Columbia, Alberta, Colorado, Idaho, and Arizona. *Central America, Europe, *Asia, *Africa.
Chromosome Number: Unreported.

2. Philonotis fontana (Hedw.) Brid., Bryol. Univ. 2: 18. 1827.
Mnium fontanum Hedw., Spec. Musc. 195. 1801.
[Synonyms: *P. fontana* var. *adpressa* (Ferg.) Limpr.; *P. caespitosa* Jur.; *P. caespitosa* f. *laxiretis* Loeske]
PLATE 212

Leaves ovate-lanceolate, apices mostly straight, margins often doubly serrate due to adjacent ends of marginal cells that form a pair of projecting points, upper cells papillose at lower ends on dorsal surface and at upper ends on ventral surface.

Habitat: On soil, often over rock, in wet places, especially roadside ditches and along streams.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, Northumberland, Queen's, Restigouche, Victoria, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Victoria, Yarmouth); Prince Edward Island (Kings, Prince).

Range: Greenland to Alaska, south to North Carolina, Tennessee, Arkansas, Nebraska, New Mexico, Arizona, and California. *South America, Europe, Asia, *Africa.

Chromosome Number: n = 6.

Remarks: An extremely variable species which has many described varieties. Only two varieties are recognized for the Maritimes and both of them are considered poor segregates.

2a. Philonotis fontana var. **americana** (Dism.) Flow. *ex* Crum, Mosses of Utah 334. 1973.
P. seriata ssp. *americana* Dism., Mem. Soc. Bot. France 17: 22. 1910.
[Synonym: *P. americana* (Dism.) Dism.]
PLATE 213

Leaves ovate-lanceolate, the apices twisted, conspicuously turned to one side when dry, margins often doubly serrate like var. *fontana*, upper cells papillose at lower ends on dorsal surface and at upper ends on ventral surface.

Habitat: On soil or rock in springs, swamps and other wet places.

Maritime Distribution: Frequent. New Brunswick (Albert, Westmorland); Nova Scotia (Inverness, Kings, Pictou, Victoria); Prince Edward Island (Prince).

Range: An endemic of North America whose range is poorly known but plants seen from New Brunswick, Nova Scotia, Prince Edward Island, Quebec, Saskatchewan, British Columbia, Nebraska, Wyoming, Colorado, Utah, Washington, Oregon, California, and Alaska; also *Vermont, *Yukon Territory, *New Mexico, *Nevada, and *Idaho.

Chromosome Number: n = 6.

2b. Philonotis fontana var. **pumila** (Turn.) Brid., Bryol. Univ. 2: 20. 1827.
Bartramia fontana var. *pumila* Turn., Musc. Hib. 107. 1804.
[Synonym: *P. tomentella* Mol.]
PLATE 214

Similar to var. *fontana* but differing in the long-excurrent costae.

Habitat: Same as var. *fontana*.

Maritime Distribution: Frequent. Nova Scotia (Annapolis, Cape Breton, Digby, Inverness, Victoria).

Range: Known from Greenland, Labrador, Nova Scotia, *Quebec, *Ontario, Manitoba, Alberta, *Saskatchewan, *British Columbia, and Northwest Territories. Europe, Africa.

Chromosome Number: Unreported.

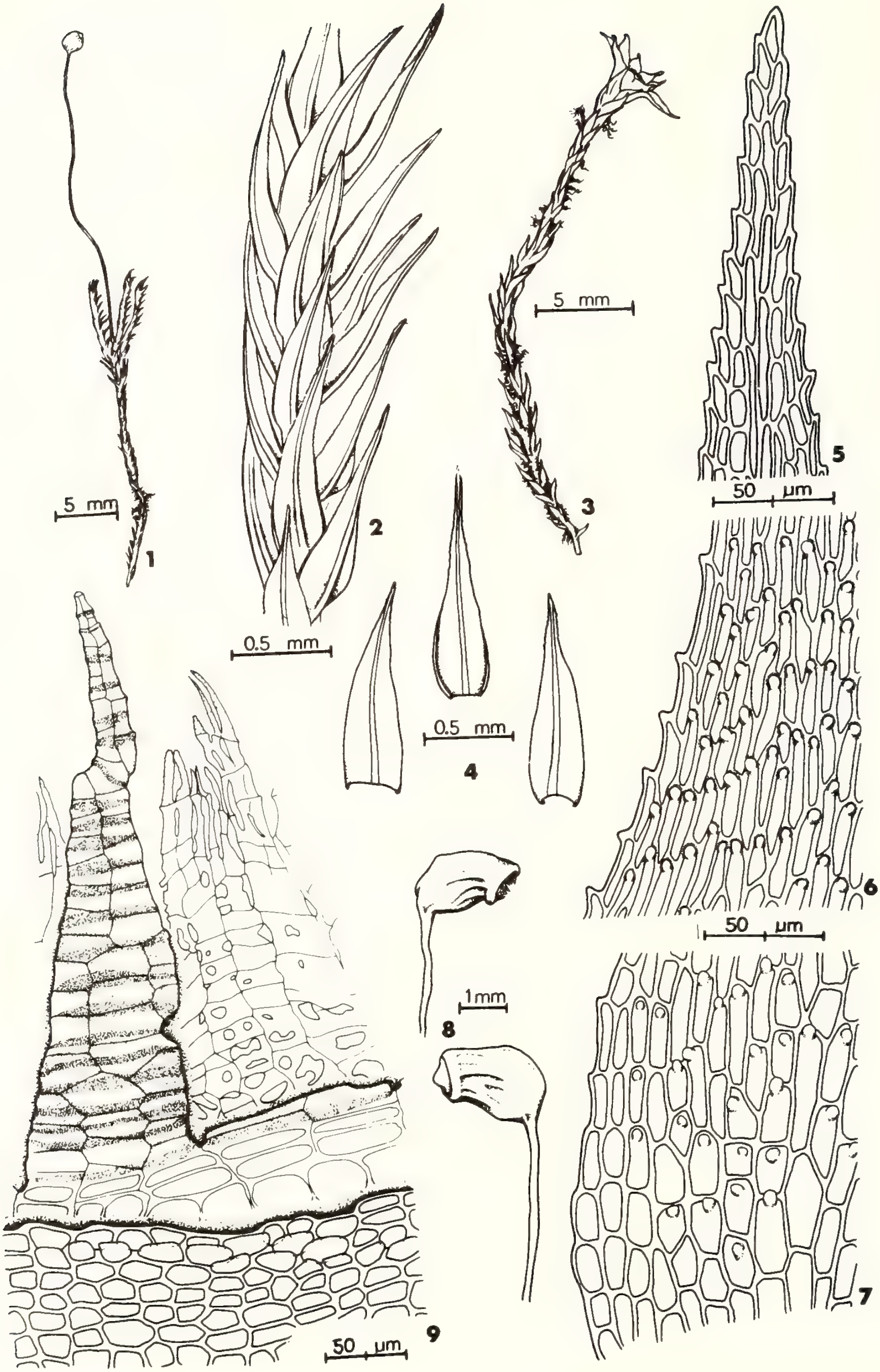
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Plate 211. *Philonotis marchica*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry). 9. Peristome teeth.

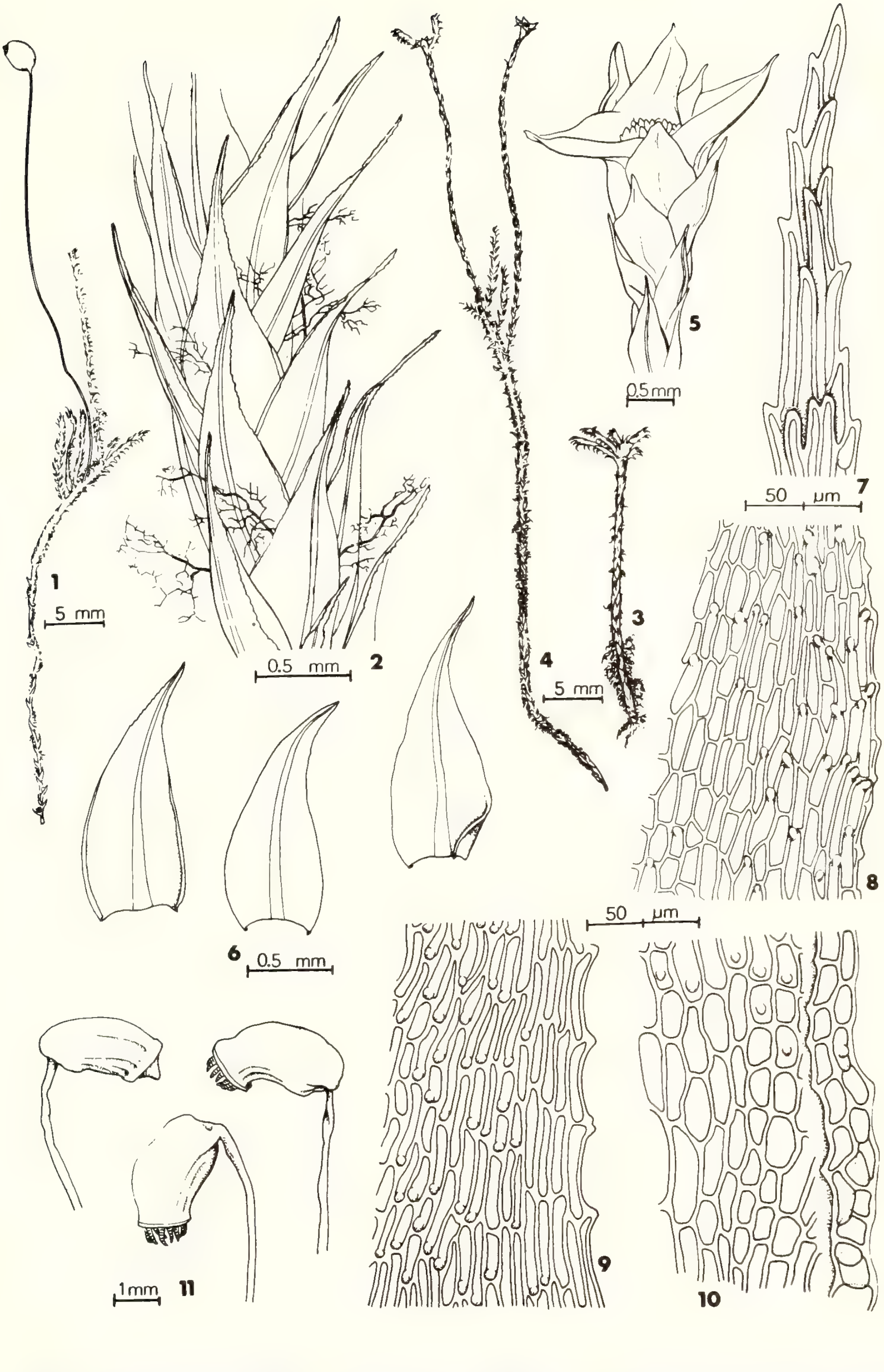
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Plate 212. *Philonotis fontana*. 1. Habit of fruiting plant. 2. Portion of stem of fruiting plant. 3. Habit of non-fruiting plant. 4. Male plant. 5. Portion of stem with perigonial bud. 6. Leaves. 7–10. Leaf cells (7, apical. 8, median-marginal on ventral surface. 9, median-marginal on dorsal surface. 10, alar.). 11. Capsules (dry).

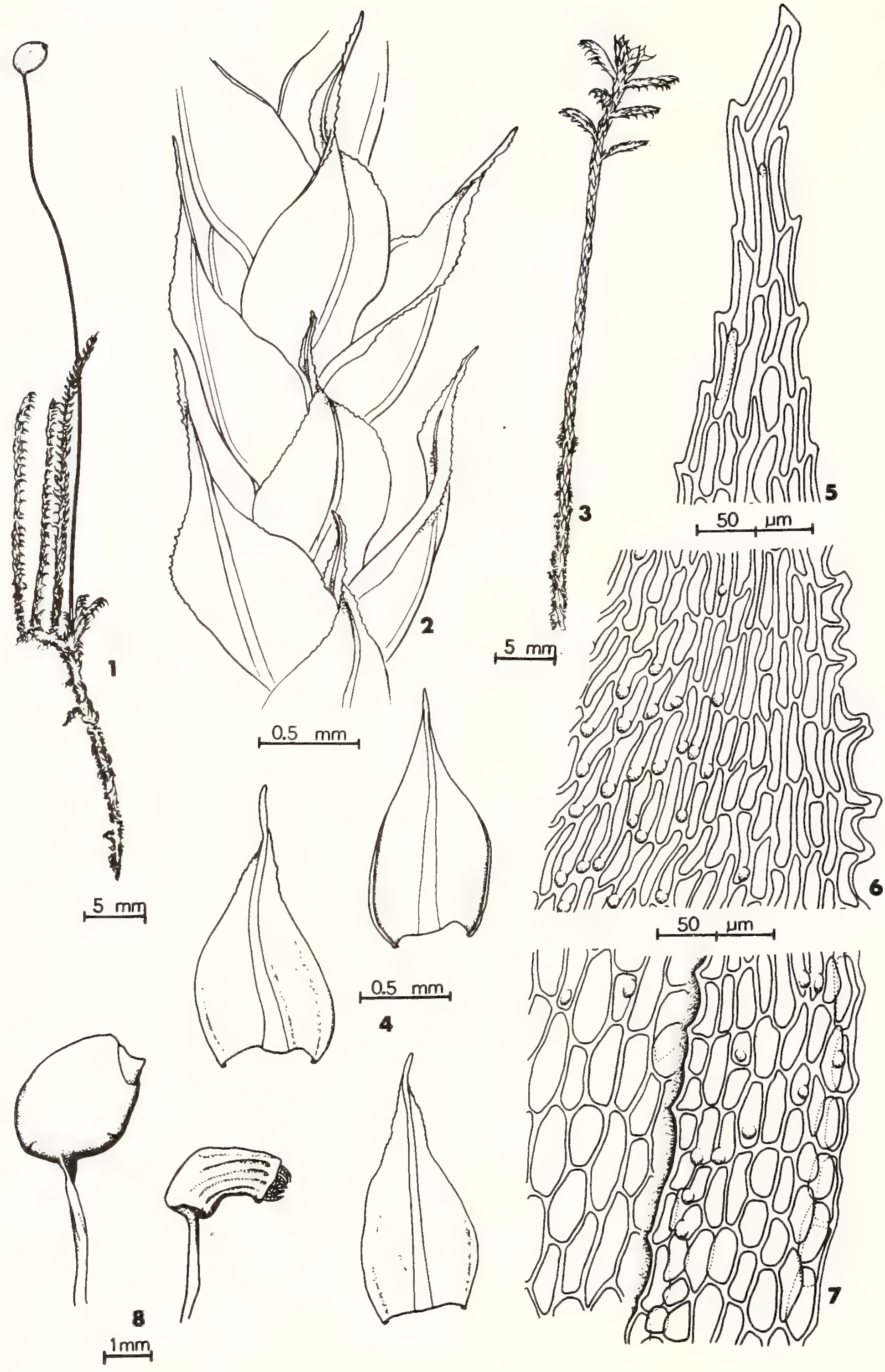
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Plate 213. *Philonotis fontana* var. *americana*. 1. Habit. 2. Portion of stem (dry). 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry).

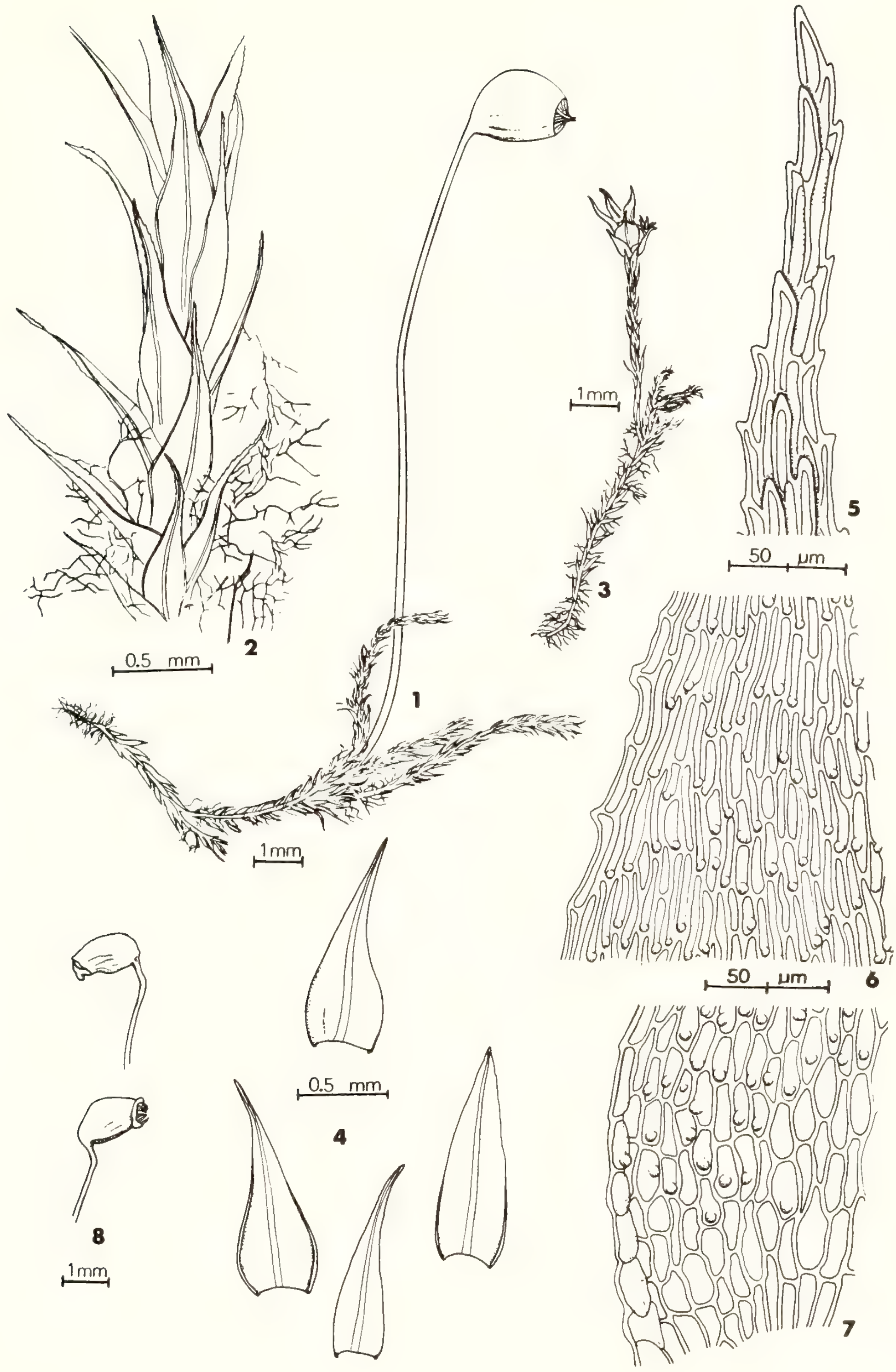
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Plate 214. *Philonotis fontana* var. *pumila*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Capsules (dry).

Family TIMMIACEAE

Timmia Hedw., Spec. Musc. 176. 1801. *nom. cons.*

Habit: In erect, loose tufts.

Colour: Green to yellowish green, brown below, dull.

Stems: 3–8 cm high, erect, simple or sometimes forked, rhizoids at base.

Leaves: Erect-spreading to wide-spreading, twisted and contorted when dry, flat below, concave or weakly keeled above, unistratose, oblong-lanceolate, acute, the base broader and sheathing stem, nondecurrent or decurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, involute when dry, serrate above, serrulate to entire below.

Costae: Single, subpercurrent to percurrent, prominent on dorsal surface, smooth or with a few teeth on dorsal surface near apex.

Leaf Cells: Smooth on dorsal surface, ventral surface mammillose, the walls thin or thick, lacking pits. Median cells quadrate to hexagonal or sometimes rounded, becoming long and rectangular near base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, often remaining attached to the tip of the seta.

Capsules: Solitary, on a seta arising from stem apex or at juncture of branch below apex, brown, oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled when dry.

Setae: Straight or sometimes slightly hooked under capsule, smooth, not or little twisted when dry, red.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Long-conic, apiculate.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, yellowish brown, endostome yellowish, 2–4 cilia, appendiculate to rudimentary.

Spores: Yellow to yellowish brown, globose, smooth to minutely papillose, 12–19 μm.

1. Costae toothed dorsally near apex; leaf bases orange .... 1. *T. austriaca*
1. Costae smooth dorsally; leaf bases hyaline to yellow .... 2. *T. megapolitana*

1. **Timmia austriaca** Hedw., Spec. Musc. 176. 1801.

PLATE 215

The orange cells at the base of the leaves and the teeth on the dorsal surface of the costae near the apex on at least some of the leaves will distinguish this species from *T. megapolitana*. Only sterile plants are known from the Maritimes.

Habitat: On rock bluff.

Maritime Distribution: Rare. New Brunswick (Restigouche). Collected 2.4 km south of St. Jean-Baptiste-de-Restigouche (*Ireland 14466*).

Range: *Greenland to *Alaska, south to New Brunswick, Michigan, South Dakota, *New Mexico, *Utah, Nevada, and California. Europe, *Asia.

Chromosome Number: n = 17.

Remarks: This species is common in western North America but in the eastern part of the continent it is extremely rare. Miller and Ireland (1979) mapped its North American distribution.

Capsules drawn from Michigan plants.

2. **Timmia megapolitana** Hedw., Spec. Musc. 176. 1801.

PLATE 216.

Differing from *T. austriaca* by the hyaline to yellow basal leaf cells and the lack of teeth on the dorsal surface of the costae. Unlike *T. austriaca* these plants were found with numerous sporophytes.

Habitat: On bank beside rivulet.

Maritime Distribution: Rare. Nova Scotia (Colchester). Collected 0.6 km southeast of Five Islands (*Ireland 17193*).

Range: *Newfoundland to *Alaska, south to *Virginia, Michigan, Illinois, Arkansas, and British Columbia. Europe, Asia.

Chromosome Number: n = 16.

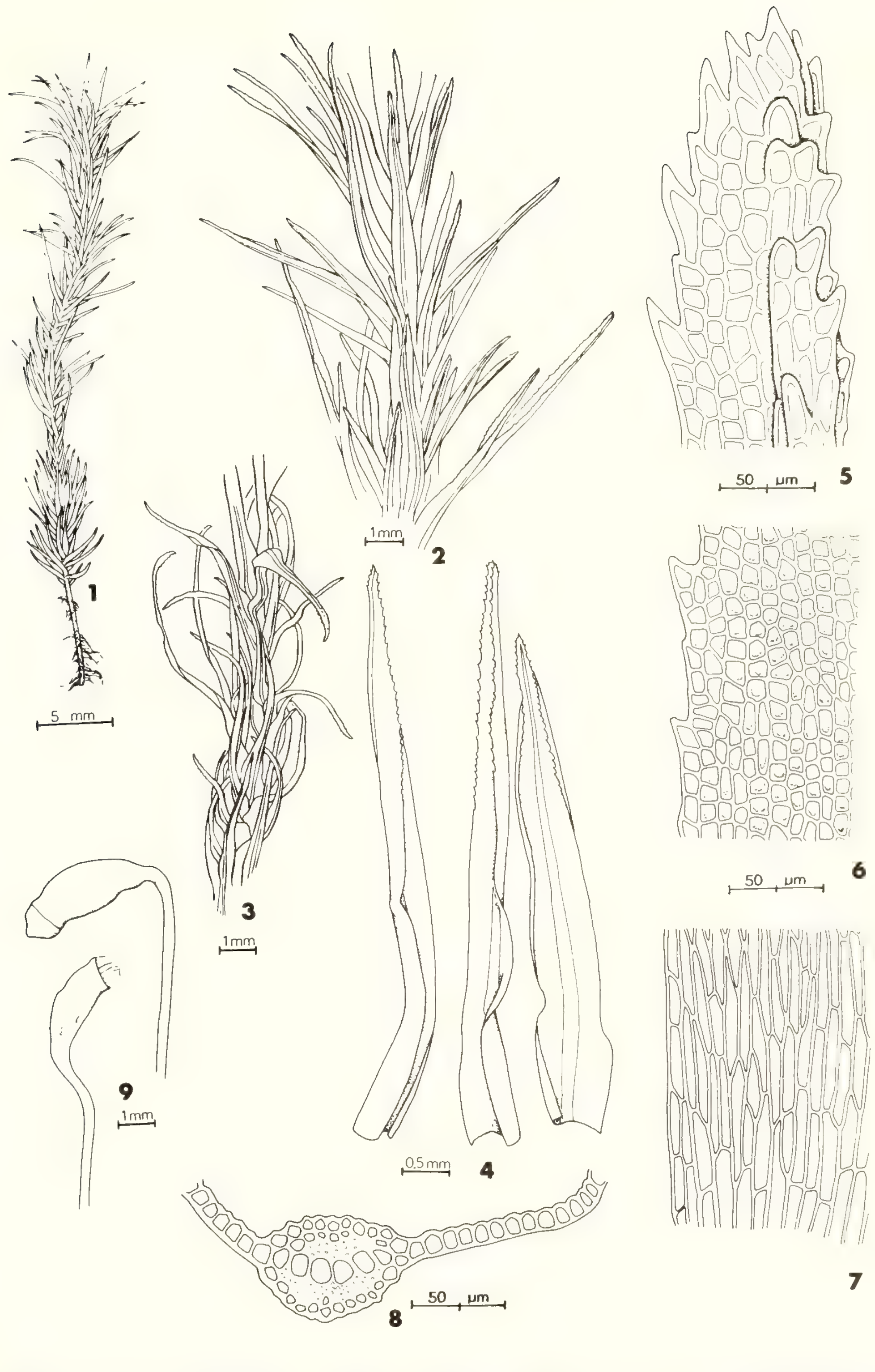
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Plate 215. *Timmia austriaca*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of costa near leaf middle. 9. Capsules, operculate (wet), inoperculate (dry).

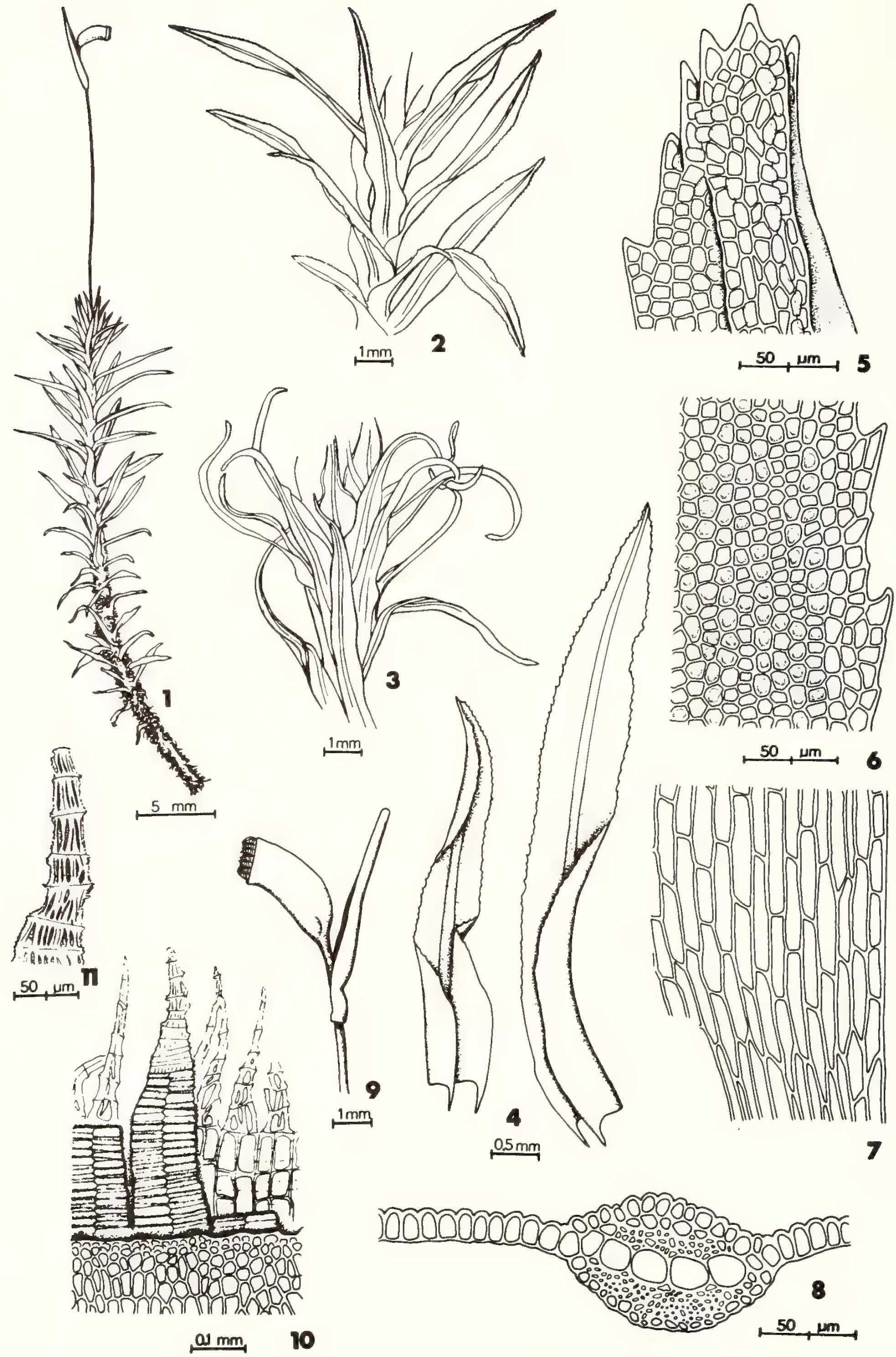
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Plate 216. *Timmia megapolitana*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of costa near leaf middle. 9. Capsule with calyptra (wet). 10. Peristome teeth. 11. Enlargement of portion of exostome tooth.

Campylostelium B.S.G., Bryol. Eur. 2: 25. 1846 (fasc. 29–30 Mon. 1.).

Habit: Erect, gregarious or scattered.

Colour: Yellowish green, becoming yellowish brown with age, glossy.

Stems: 0.6–1.0 mm high, erect, simple, rarely forked, rhizoids at base.

Leaves: Erect to erect-spreading, crisped when dry, keeled, lamina unistratose except on margins, linear-lanceolate, acute, oblong at base, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, entire throughout, often bistratose above leaf middle.

Costae: Single, subpercurrent, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick, lacking pits. Median cells quadrate, rectangular, rounded or irregularly angled, becoming longer, rectangular, thin-walled at base.

Asexual Reproductive Bodies. Lacking.

Sex: Autoicous.

Calyptrae: Mitrate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on a seta arising from stem apex, yellow to yellowish brown, cylindric, straight, erect, smooth to striate.

Setae: Arcuate, smooth, twisted when dry, yellowish.

Annuli: 2–3 rows of cells, deciduous.

Opercula: Long-rostrate.

Peristomes: Single, consisting of 16 teeth, filiform, papillose, entire or often bifid and divided nearly to base, yellow or orange.

Spores: Yellow to yellowish brown, globose, smooth, 7–12 μm.

1. Campylostelium saxicola (Web. & Mohr) B.S.G., Bryol. Eur. 2: 27. 116. 1846 (fasc. 29–30 Mon. 3.1).
Dicranum saxicola Web. & Mohr, Bot. Taschenb. 167. 1807.
PLATE 217

Small plants, stems about 1 mm high, leaves linear-lanceolate, keeled, acute, 1–4 mm long, margins plane, entire, often bistratose above leaf middle; setae arcuate, smooth, 3–6 mm long, capsules cylindric, straight, urn 0.5–1.0 mm long, operculum long-rostrate.

Habitat: On sandstone boulders in woods.

Maritime Distribution: Rare. Nova Scotia (Queens); Prince Edward Island (Kings, Queens).

Range: Sporadic in North America where it is known from Nova Scotia, Prince Edward Island, *New York, New Jersey, Tennessee, North Carolina, Arkansas, and Washington. Europe.

Chromosome Number: Unreported.

Remarks: Resembling a species of *Seligeria* but differing primarily in the plants that have crisped leaves when dry, leaf margins that are bistratose above and peristome teeth that are papillose and often bifid. *Seligeria* taxa have mostly straight leaves with unistratose margins and smooth, entire peristome teeth.

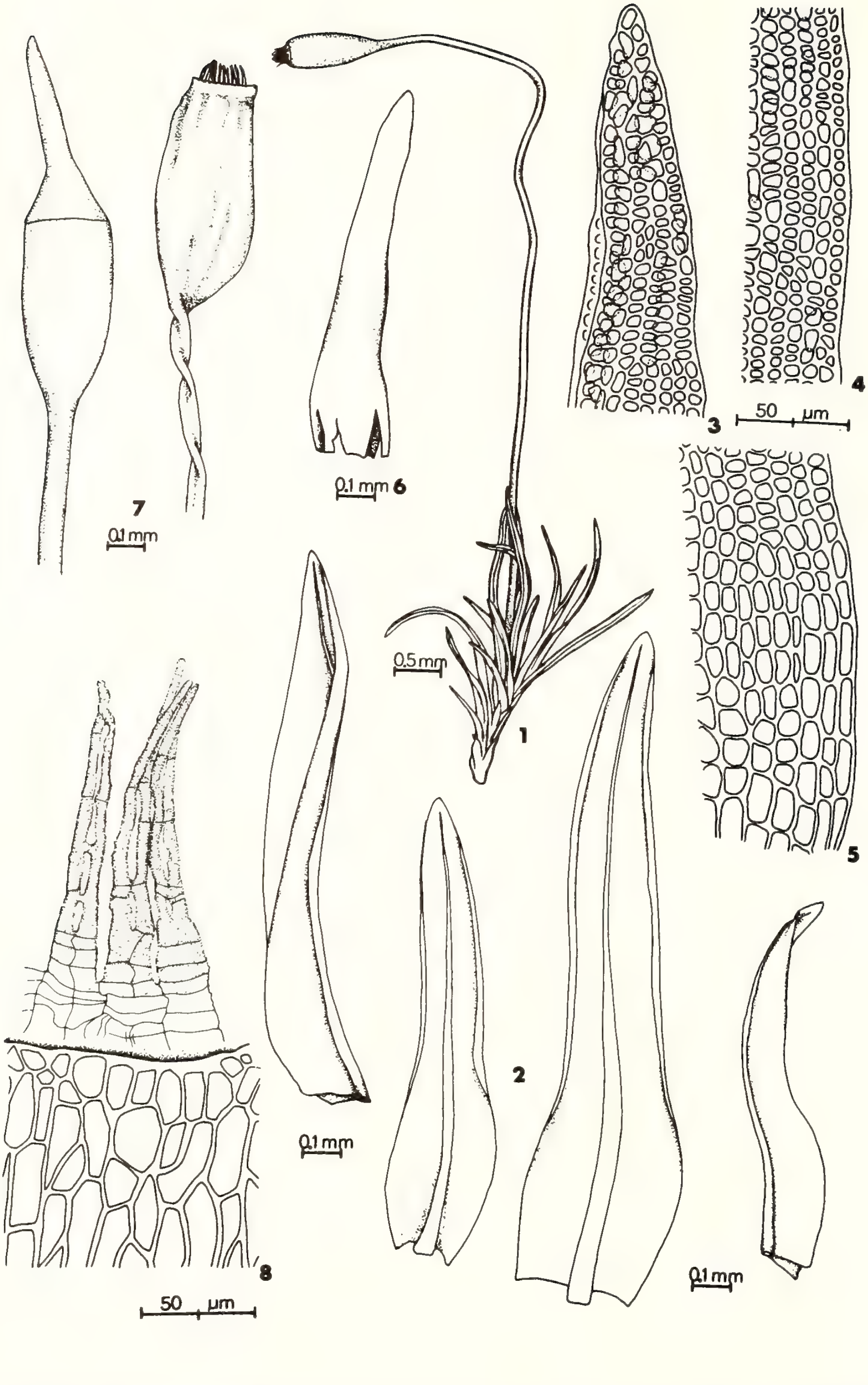
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Plate 217. *Campylostelium saxicola*. 1. Habit. 2. Leaves. 3–5. Leaf cells (3, apical. 4, median-marginal. 5, alar.). 6. Calyptra. 7. Capsules, operculate (wet), inoperculate (dry). 8. Peristome teeth.

Family ORTHOTRICHACEAE

1. Primary stems prostrate, with numerous erect branches .... 5. *Drummondia* (p. 407)
1. Primary stems erect, with few branches 2
    2. Leaves strongly crisped when dry; gemmae sometimes present, always at tips of leaves ... 3
        3. Leaf cells multipapillose; peristome lacking; gemmae lacking .... 2. *Amphidium* (p. 389)
        3. Leaf cells unipapillose; peristome present; gemmae sometimes at tips of leaves .... 4. *Ulota* (in part) (p. 401)
    2. Leaves straight or weakly crisped when dry; gemmae sometimes present, always on rhizoids, on stems in leaf axils or on surface of leaves 4
        4. Gemmae common on stems in leaf axils and on rhizoids; leaf margins plane, cells multipapillose; sex organs and sporophytes lacking on Maritime plants .... 1. *Zygodon* (p. 385)
        4. Gemmae lacking or present on leaf surface; leaf margins usually recurved, cells often unipapillose; sex organs and sporophytes usually present 5
            5. Leaves with two types of cells at base, thick-walled, linear cells near costa and short cells with thick cross-walls along margins; stomata superficial, confined to neck of capsule .... 4. *Ulota* (in part) (p. 401)
            5. Leaves with only one type of cell at base and lacking differentiated cells along margins; stomata superficial or immersed, not confined to neck of capsule .... 3. *Orthotrichum* (p. 392)

1. Zygodon Hook. & Tayl., Musc. Brit. 70. 1818.

Habit: In erect, loose to dense tufts.
Colour: Green to brownish green, brown below.
Stems: 0.5–1.0 cm high, erect, simple or forked, rhizoids at base and among leaves.
Leaves: Spreading to recurved, somewhat contorted when dry, slightly keeled to nearly flat, unistratose, linear-lanceolate to ovate-lanceolate, acuminate, often ending in several hyaline cells, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane, entire throughout.
Costae: Single, subpercurrent, prominent on dorsal surface.
Leaf Cells: Multipapillose, the walls thick, lacking pits. Median cells round, elliptic or irregularly rounded, becoming longer near base.
Asexual Reproductive Bodies: Fusiform or clavate brood bodies, uniseriate, 3–7 cells, produced on rhizoids and in leaf axils.
Sex: Dioicous. No sex organs or sporophytes known from the Maritimes.
Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.
Capsules: Solitary, exserted, on a seta arising from stem apex, brown to reddish brown, cylindric to pyriform, straight, erect, smooth, 8-ribbed when dry, contracted at mouth, stomata superficial, confined to neck.
Setae: Straight, smooth, twisted when dry, brown.
Annuli: Lacking.
Opercula: Rostrate, beak straight or arcuate.
Peristomes: Lacking or present and double, 16 exostome teeth, lanceolate, united in pairs, 8 endostome segments, linear, shorter than exostome.
Spores: Globose, minutely papillose, 11–16 μm

1. Gemmae fusiform, 5–7 celled .... 1. *Z. conoideus*
1. Gemmae clavate, 3–5 celled .... 2. *Z. viridissimus*

1. **Zygodon conoideus** (Dicks.) Hook. & Tayl., Musc. Brit. 71. 21. 1818.
Bryum conoideum Dicks., Pl. Crypt. Brit. fasc. 4: 9. 1801.
PLATE 218

Similar to *Z. viridissimus* but the leaves broader, ovate-lanceolate, and with 5–7 celled, fusiform propagula.

Habitat: On tree trunks, especially maple and beech.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Halifax, Lunenburg, Queens, Yarmouth).

Range: Known only from Newfoundland, Nova Scotia, and Virginia. Europe, *Africa.

Chromosome Number: n = 11.

2. **Zygodon viridissimus** (Dicks.) Brid., Bryol. Univ. 1: 592. 1826.
Bryum viridissimum Dicks., Pl. Crypt. Brit. fasc. 4: 9. 1801.
PLATE 219

Plants about 1 cm high, not known with sporophytes from the Maritimes, leaves linear-lanceolate to oblong-lanceolate, acuminate, often ending in several hyaline cells, cells papillose, costae subpercurrent, propagula usually present, 3–5 celled, clavate bodies on rhizoids and in leaf axils.

Habitat: On tree trunks, often maple or elm, or rarely on cliffs.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte); Nova Scotia (Annapolis, Digby, Halifax, Inverness, Shelburne, Victoria).

Range: Nova Scotia to *Manitoba, south to North Carolina and Tennessee; also in western North America from British Columbia to California. *Central America, Europe, *Asia, *Africa.

Chromosome Number: n = 12.

Remarks: Capsules drawn from British Columbia plants.

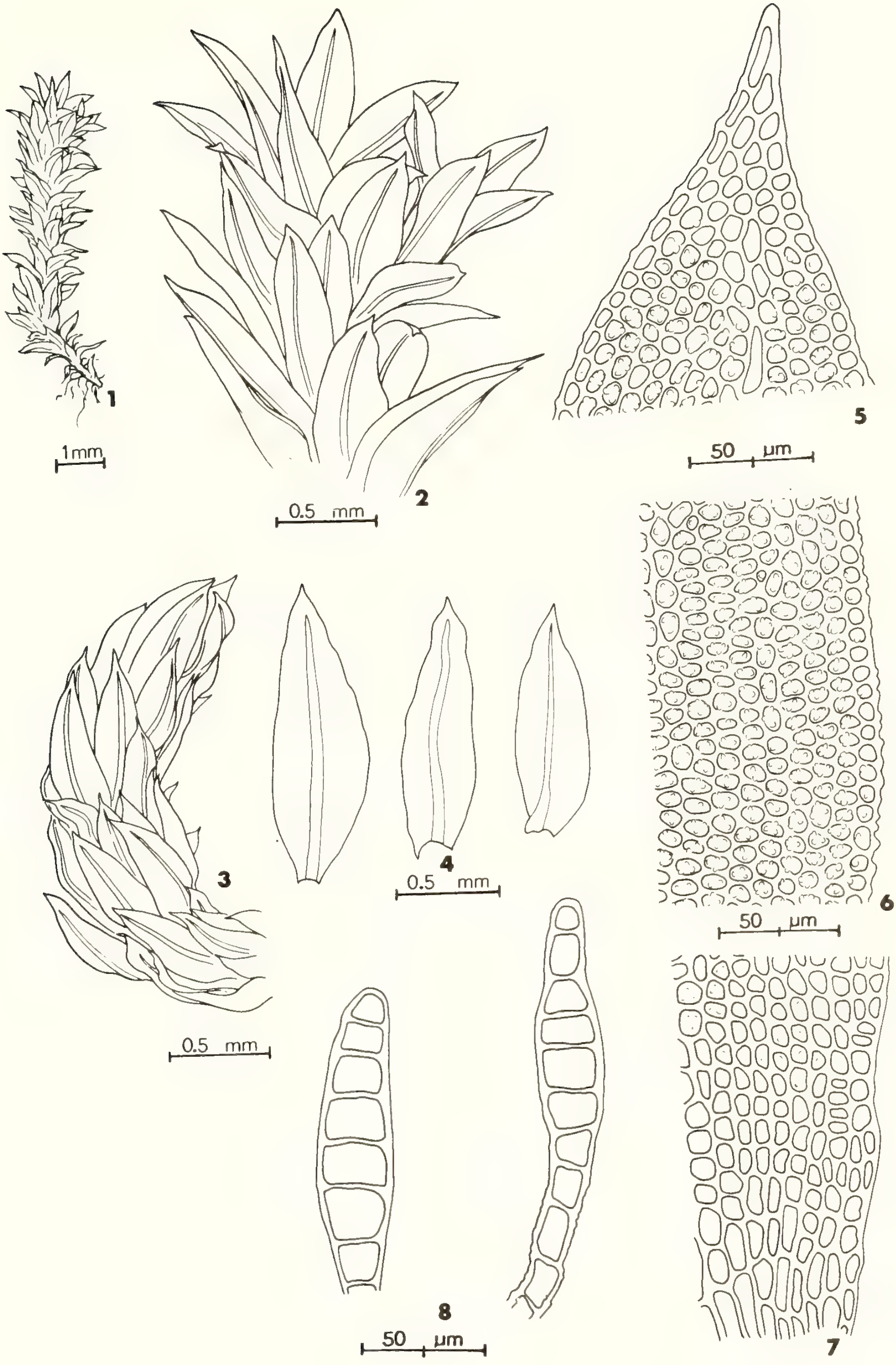
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Plate 218. *Zygodon conoideus*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Gemmae.

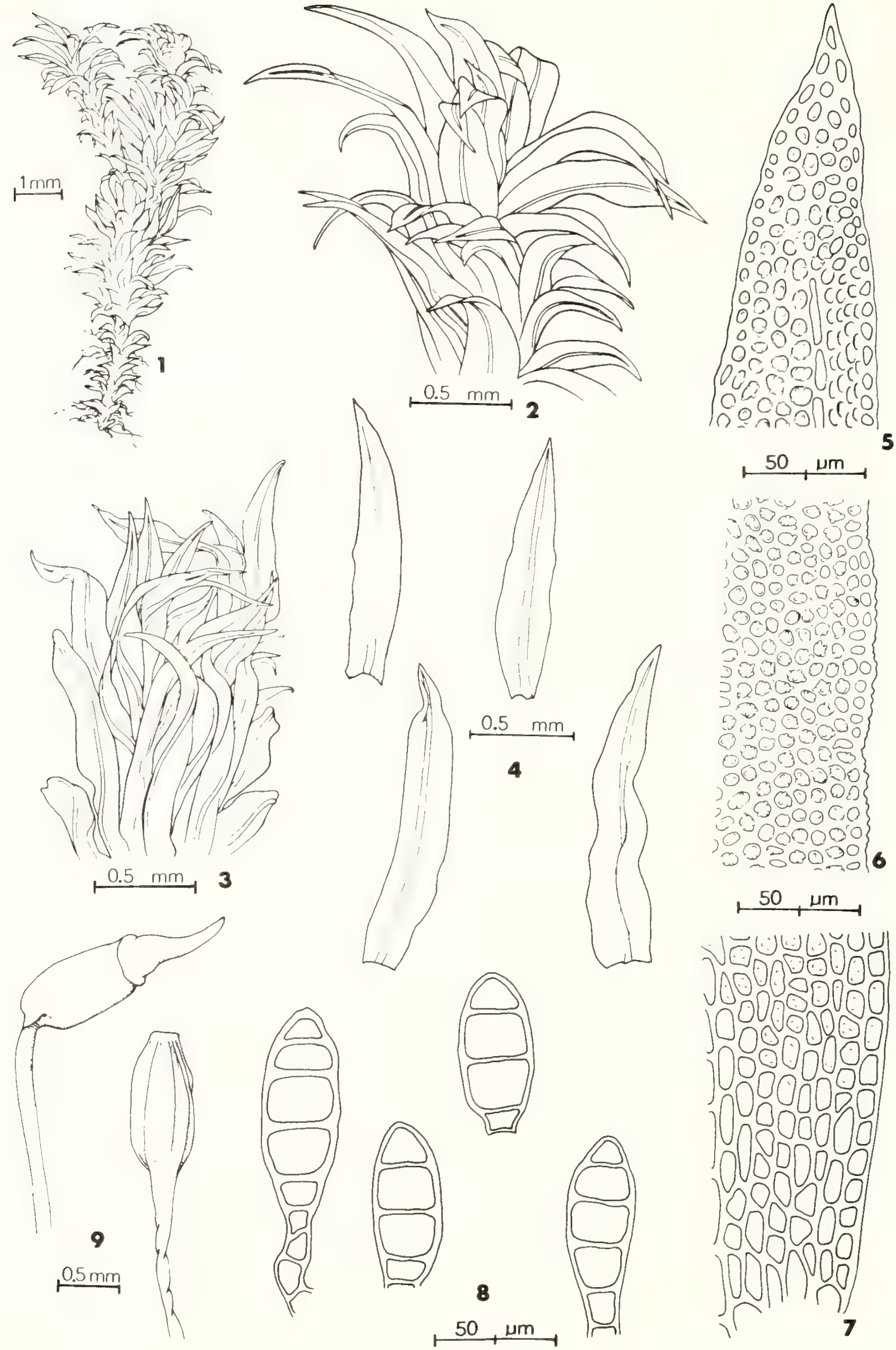
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Plate 219. *Zygodon viridissimus*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Gemmae. 9. Capsules (dry).

2. **Amphidium** Schimp., Coroll. 39. 1856. *nom. cons.*

Habit: In erect, dense tufts.
Colour: Green to yellowish green, brown below.
Stems: 1–7 cm high, erect, simple or forked, rhizoids at base and often among leaves.
Leaves: Erect-spreading, crisped when dry, keeled, unistratose, linear-lanceolate, acute, nondecurrent. Perichaetial leaves differentiated, sheathing, acuminate, sometimes undifferentiated.
Leaf Margins: Recurved from base to leaf middle or plane except for a portion recurved at base, entire or serrulate above.
Costae: Single, subpercurrent, prominent on dorsal surface.
Leaf Cells: Densely papillose with round to elliptic papillae, often appearing as striations, the walls thick, papillose, lacking pits. Median cells round, elliptic or irregularly rounded, becoming longer near base.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous or dioicous.
Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.
Capsules: Solitary, immersed, on a short seta arising from stem apex or a short branch below, brown, urceolate, straight, erect, smooth, 8-ribbed when dry, stomata superficial, confined to neck.
Setae: Straight, smooth, not twisted when dry, brown.
Annuli: Lacking.
Opercula: Conic-apiculate to short-rostrate, beak straight or arcuate.
Peristomes: Lacking.
Spores: Yellow to yellowish brown, globose, smooth, 10–15 μm.

1. Plants autoicous, often with sporophytes, perichaetial leaves sheathing; leaves glossy below, dull above, margins plane or recurved at base; papillae on leaf cells round or nearly so .... 1. *A. lapponicum*
1. Plants dioicous, sporophytes unknown from Maritimes but if present, perichaetial leaves not sheathing; leaves glossy, margins distinctly recurved from base to middle; papillae on leaf cells elliptic, often in rows and appearing as striae .... 2. *A. mougeotii*

1. Amphidium lapponicum (Hedw.) Schimp., Coroll. 39. 1856.
Anictangium lapponicum Hedw., Spec. Musc. 40. 1801.
PLATE 220

Autoicous plants, leaves linear-lanceolate, glossy below, dull above, margins plane or recurved at base, cells densely papillose nearly throughout, papillae round or nearly so; perichaetial leaves sheathing, capsules emergent, eperistomate, urn 8-ribbed when dry.

Habitat: In crevices and on ledges of cliffs.
Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Restigouche, York); Nova Scotia (Colchester, Digby, Hants, Inverness, Kings, Lunenburg, Victoria).
Range: Greenland to Alaska, south to Virginia, Michigan, Minnesota, Colorado, Arizona, Nevada, and California. Europe, *Asia, *Africa.
Chromosome Number: n = 13, 16.

2. Amphidium mougeotii (B.S.G.) Schimp., Coroll. 40. 1856.
Zygodon mougeotii B.S.G., Bryol. Eur. 3: 39. 206. 1838 (fasc. 4 Mon. 7.1).
[Synonym: *Anoectangium mougeotii* (B.S.G.) Lindb.]
PLATE 221

Dioicous plants, leaves linear-lanceolate, glossy, margins distinctly recurved from base to middle, cells densely papillose nearly throughout, papillae elliptic, often in rows appearing as striae; sporophytes unknown from Maritimes, if present, perichaetial leaves not sheathing, capsules similar to *A. lapponicum*.

Habitat: In crevices and on ledges of cliffs.
Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte); Nova Scotia (Colchester, Cumberland, Digby, Guysborough, Inverness, Victoria).
Range: Greenland to Alaska, south to North Carolina, Tennessee, *Ohio, Minnesota, Montana, and Oregon. Europe, *Asia
Chromosome Number: n = 13.
Remarks: Capsules drawn from Alberta plants.

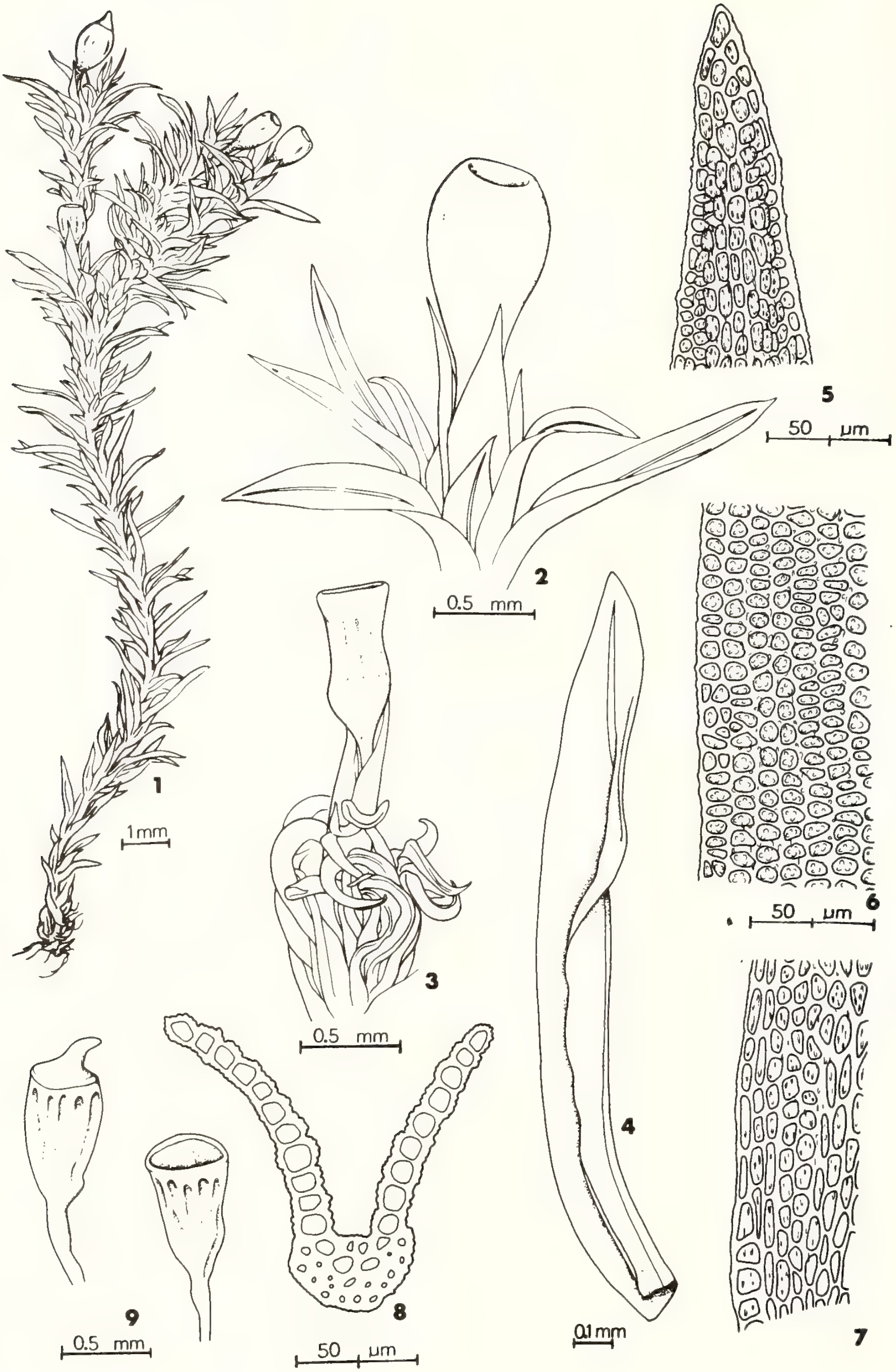
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Plate 220. *Amphidium lapponicum*. 1. Habit. 2. Portion of stem with perichaetial leaves and capsule (wet). 3. Portion of stem with perichaetial leaves and capsule (dry). 4. Leaf. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9. Capsules (dry).

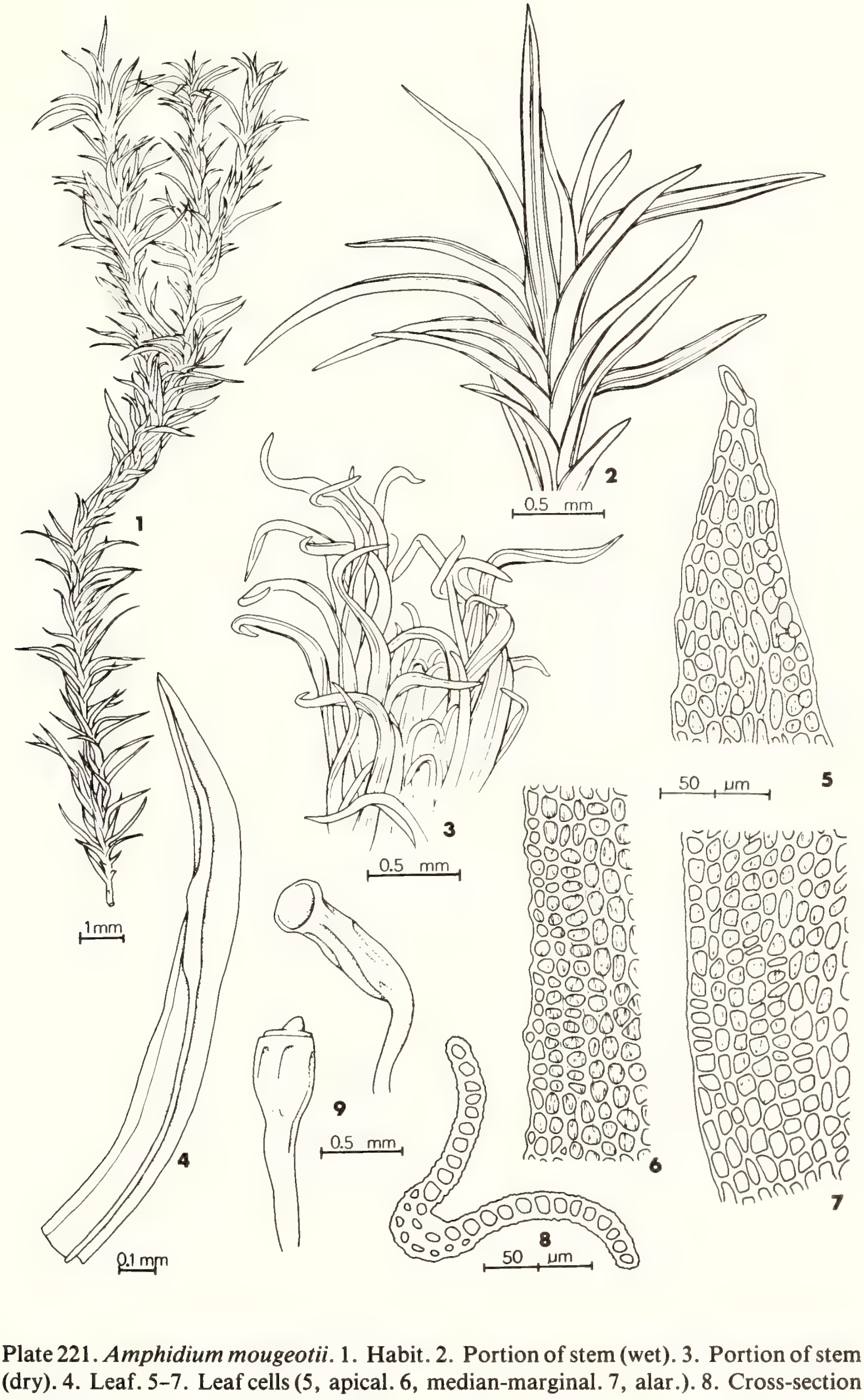
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Plate 221. *Amphidium mougeotii*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaf. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Cross-section of leaf above middle. 9. Capsules (dry).

3. **Orthotrichum** Hedw., Spec. Musc. 162. 1801.

Habit: In erect, loose to dense, often rounded tufts.
Colour: Green or yellowish green, brown below.
Stems: 0.5–3.0 cm high, erect, simple or forked, rhizoids at base.
Leaves: Erect-spreading to wide-spreading or nearly squarrose, imbricate when dry, usually keeled, sometimes concave, unistratose, ovate, lanceolate or linear-lanceolate, acute to obtuse, nondecurrent. Perichaetial leaves undifferentiated.
Leaf Margins: Plane to revolute from base to near apex, entire.
Costae: Single, subpercurrent, prominent on dorsal surface.
Leaf Cells: Unipapillose to multipapillose on both surfaces, the walls thick, lacking pits, sometimes pitted below. Median cells rounded to irregularly rounded, becoming elongate and rectangular near base.
Asexual Reproductive Bodies: Lacking or present, green or reddish brown, uniseriate gemmae, 4–6 cells, produced on both surfaces of the leaves.
Sex: Autoicous or dioicous.
Calyptrae: Mitrate, naked or hairy, the hairs sometimes papillose, whitish or yellowish with a reddish tip.
Capsules: Solitary, immersed to exserted, on a short seta arising from stem apex or a short branch below, yellowish brown to brown, ovoid to cylindric, straight, erect, smooth, 8- or 16-ribbed when dry, stomata superficial or immersed, occurring in urn and neck.
Setae: Straight, smooth, sometimes twisted when dry, yellowish brown to brown.
Annuli: Lacking or poorly differentiated and persistent.
Opercula: Rostrate, base conic, beak straight or somewhat arcuate.
Peristomes: Double or single, consisting of 8 or 16 lanceolate teeth, papillose or striate, erect or reflexed, yellow, brown or reddish brown, endostome filiform, erect or inflexed, sometimes lacking.
Spores: Yellow to yellowish brown, globose, papillose, 14–24 μm.

Vitt (1973a) monographed the Orthotricha of North America.

1. Leaves broadly obtuse, margins plane; gemmae usually present .... 1. *O. obtusifolium*
1. Leaves acute to narrowly obtuse, margins recurved; gemmae rarely present 2
  2. Capsules with superficial stomata (phaneropore) 3
    3. Capsules immersed to slightly exserted above perichaetial leaves, strongly contracted under mouth giving capsules bulbous appearance .... 2. *O. sordidum*
    3. Capsules exserted above perichaetial leaves, weakly or not at all contracted under mouth 4
      4. Capsules obscurely ribbed when dry and mature .... 3. *O. speciosum*
      4. Capsules smooth or nearly so when dry and mature .... 3a. *O. speciosum* var. *elegans*
  2. Capsules with immersed stomata (cryptopore) 5
    5. Capsules exserted above perichaetial leaves; plants on calcareous rock .... 4. *O. anomalum*
    5. Capsules immersed to slightly exserted above perichaetial leaves; plants on trees ... 6
      6. Leaves wide-spreading to nearly squarrose; capsules strongly constricted below mouth when dry; exothecial cells of ribs in bands 5–8 cells wide .... 5. *O. stellatum*
      6. Leaves erect-spreading; capsules not or only slightly constricted below mouth when dry; exothecial cells of ribs in bands 4 cells wide ... 6. *O. ohioense*

1. Orthotrichum obtusifolium Brid., Musc. Rec. 2(2): 23. 1801.
PLATE 222

Distinguished from the other Maritime species in the genus by the broadly obtuse leaves with plane margins and the presence of numerous, filamentous, 4–6 celled, green or reddish brown gemmae on the leaves.

Habitat: On tree trunks, usually deciduous (elm, maple, poplar, willow) or rarely coniferous.
Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Madawaska,

Restigouche, Westmorland, York); Nova Scotia (Annapolis, Colchester, Halifax, Inverness, Kings, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Labrador to Alaska, south to *North Carolina, Michigan, Minnesota, New Mexico, and California. Europe. *Asia.

Chromosome Number: n = 11.

Remarks: *Orthotrichum gymnostomum* Bruch *ex* Brid., a rare species in North America occurring only on deciduous trees in the coastal areas of Newfoundland, should be sought in the Maritime Provinces. It is somewhat similar to *O. obtusifolium* but differs in the leaves with involute margins, cells with 2-3 papillae and immersed, eperistomate capsules.

2. Orthotrichum sordidum Sull. & Lesq. *ex* Aust., Musci Appal. n. 168. 1870.

PLATE 223

Plants corticolous, capsules immersed to somewhat exserted above perichaetial leaves, strongly ribbed, usually strongly contracted under mouth giving it a bulbous appearance and with superficial stomata.

Habitat: On tree trunks.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Restigouche); Nova Scotia (Annapolis, Halifax, Hants, Inverness, Kings, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: *Newfoundland to Ontario, south to *New York and Michigan; disjunct in Alaska. *Japan.

Chromosome Number: n = 6.

3. Orthotrichum speciosum Nees *ex* Sturm, Deutschl. Fl. 2(3): (fasc. 17): 5. 1819.

PLATE 224

Plants corticolous, capsules exserted above perichaetial leaves, obscurely ribbed, not or weakly contracted under mouth and with superficial stomata.

Habitat: On tree trunks or reported rarely on rock.

Maritime Distribution: Frequent. New Brunswick (Kent, Restigouche, York); Nova Scotia (Annapolis, Colchester, Halifax, Hants, Pictou); Prince Edward Island (Kings, Queens).

Range: Labrador to Alaska, south to Louisiana, Montana, Idaho, and California. Greenland, *South America, *Europe, *Asia, *Africa.

Chromosome Number: n = 6, 12, 13.

3a. Orthotrichum speciosum var. **elegans** (Schwaegr. *ex* Hook. & Grev.) Warnst., Hedwigia 53: 314. 1913.

Orthotrichum elegans Schwaegr. *ex* Hook. & Grev., Edinburgh J. Sci. 1(1): 122. 1824.

PLATE 224

Differing from var. *speciosum* only by the narrower capsules that are smooth or nearly so.

Habitat: On tree trunks or reported rarely on rock.

Maritime Distribution: Frequent. New Brunswick (Carleton, Charlotte, Madawaska, Restigouche, Victoria, York); Nova Scotia (Cumberland, Victoria); Prince Edward Island (Queens).

Range: Nova Scotia to *British Columbia, south to New Jersey, *Ohio, Michigan, and Oregon. Europe, *Asia.

Chromosome Number: Unreported.

4. Orthotrichum anomalum Hedw., Spec. Musc. 162. 1801.

PLATE 225

Plants saxicolous, capsules exserted above perichaetial leaves, when dry with 8 long ribs alternating with 8 short ribs (sometimes indistinct) and with immersed stomata.

Habitat: On rocks, usually calcareous.

Maritime Distribution: Frequent. New Brunswick (Albert, Saint John, Victoria, York); Nova Scotia (Inverness).

Range: Labrador to Alaska, south to Virginia, Illinois, New Mexico, and Arizona. Mexico, *Central America, Europe, *Asia, *Africa.

Chromosome Number: n = 11, 22.

Remarks: This is the only Maritime *Orthotrichum* that occurs on rock.

5. Orthotrichum stellatum Brid., Bryol. Univ. 1: 274. 1826.

PLATE 226

Plants corticolous, capsules immersed to slightly exserted above perichaetial leaves, strongly constricted below mouth and ribbed when dry, the exothecial cells of ribs in bands 5-8 cells wide and stomata immersed.

Habitat: On tree trunks.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Queen's, Victoria, York); Nova Scotia (Annapolis, Colchester, Digby, Halifax, Inverness, Pictou, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Newfoundland to Ontario, south to *North Carolina, *Arkansas, and *Oklahoma. Europe.

Chromosome Number: Unreported.

6. Orthotrichum ohioense Sull. & Lesq. *ex* Aust., Musci Appal. n. 169. 1870.

PLATE 227

Plants corticolous, capsules immersed to slightly exserted above perichaetial leaves, not or weakly constricted below mouth and ribbed when dry, the exothecial cells of ribs in bands 4 cells wide and stomata immersed.

Habitat: On tree trunks.

Maritime Distribution: Common. New Brunswick (Carleton, Charlotte, Queen's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Colchester, Digby, Kings, Queens); Prince Edward Island (Queens).

Range: Endemic to North America, occurring from Nova Scotia to Ontario, south to *South Carolina, *Mississippi, and Arkansas.

Chromosome Number: n = 11.

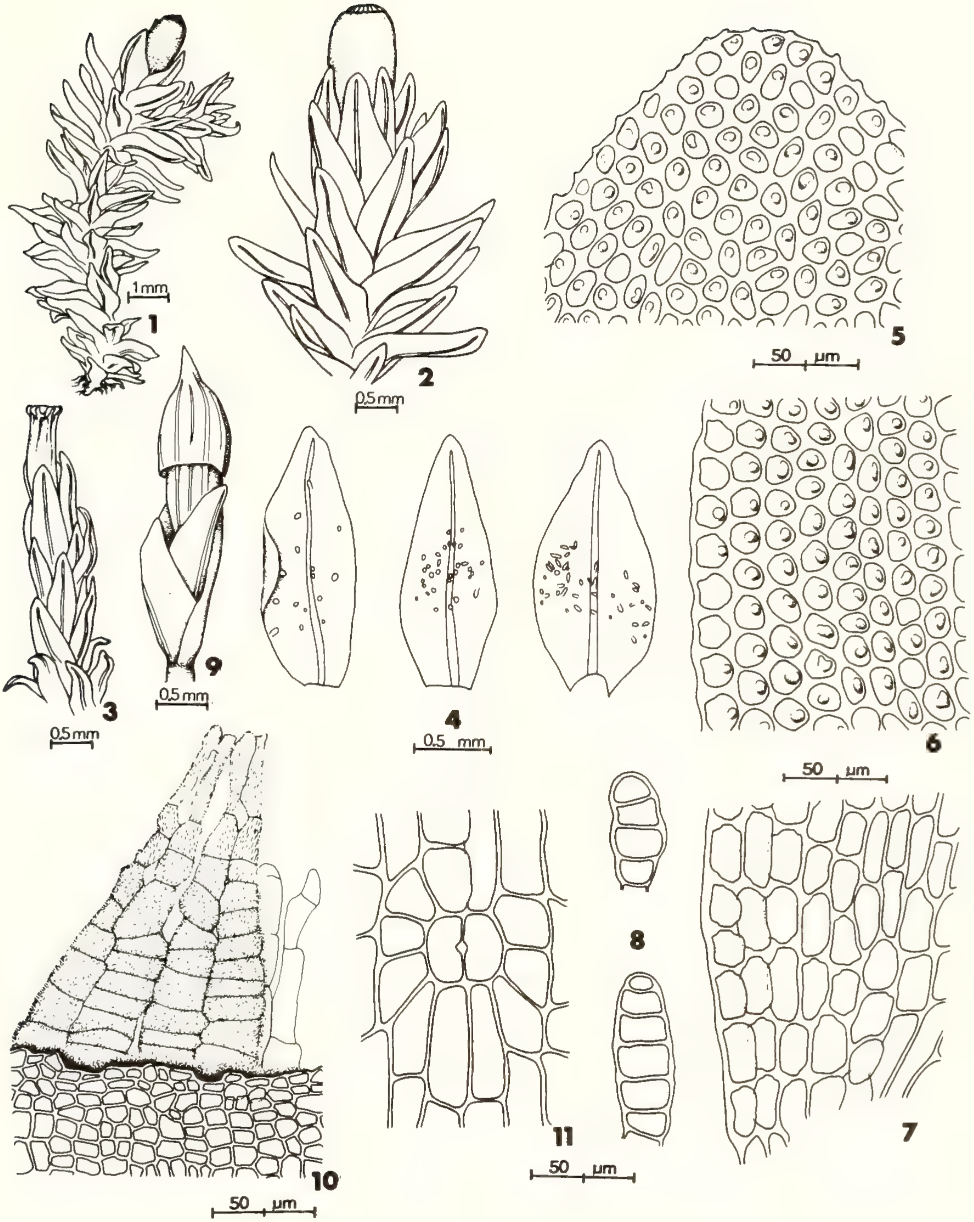
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Plate 222. *Orthotrichum obtusifolium*. 1. Habit. 2. Portion of stem with capsule (wet). 3. Portion of stem with capsule (dry). 4. Leaves with gemmae. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Gemmae. 9. Calyptrate capsule (dry). 10. Peristome teeth. 11. Stoma.

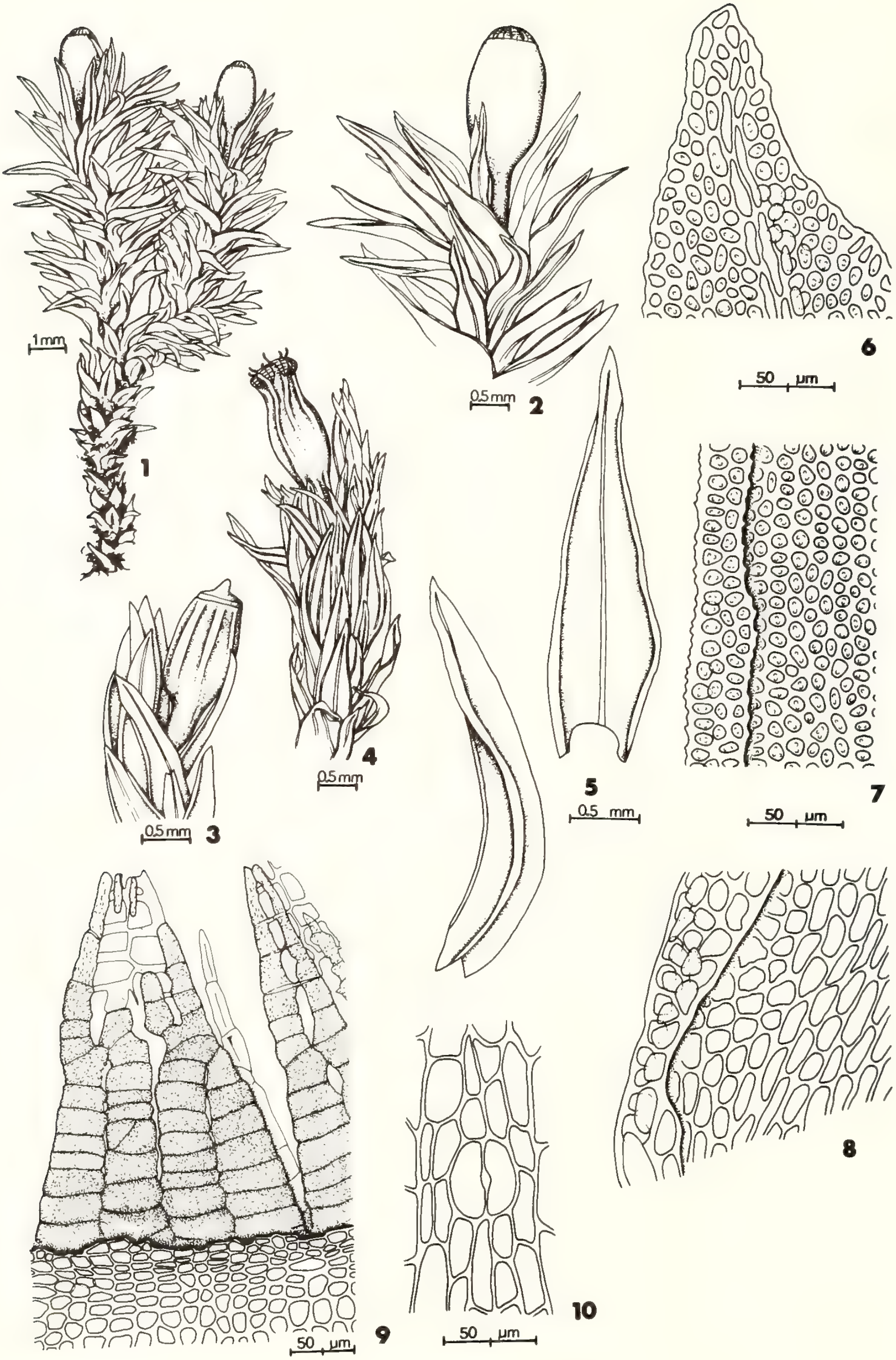
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Plate 223. *Orthotrichum sordidum*. 1. Habit. 2. Portion of stem with capsule (wet). 3–4. Portion of stems with capsules (dry). 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Peristome teeth. 10. Stoma.

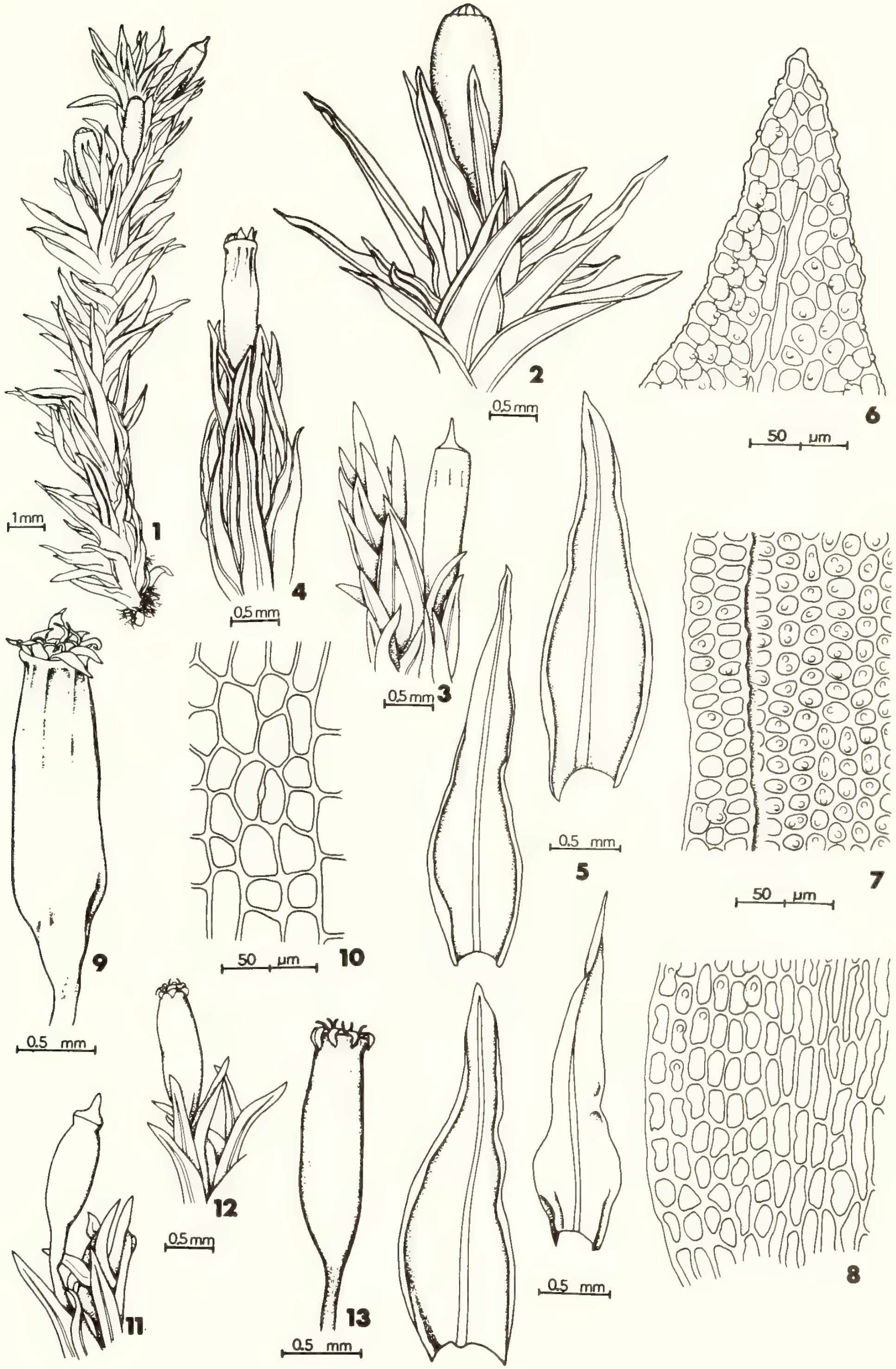
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Plate 224. 1–10. *Orthotrichum speciosum*. 1. Habit. 2. Portion of stem with capsule (wet). 3–4. Portion of stems with capsules (dry). 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Capsule (dry). 10. Stoma. 11–13. *Orthotrichum speciosum* var. *elegans*. 11–12. Portion of stems with capsules (dry). 13. Capsule (dry).

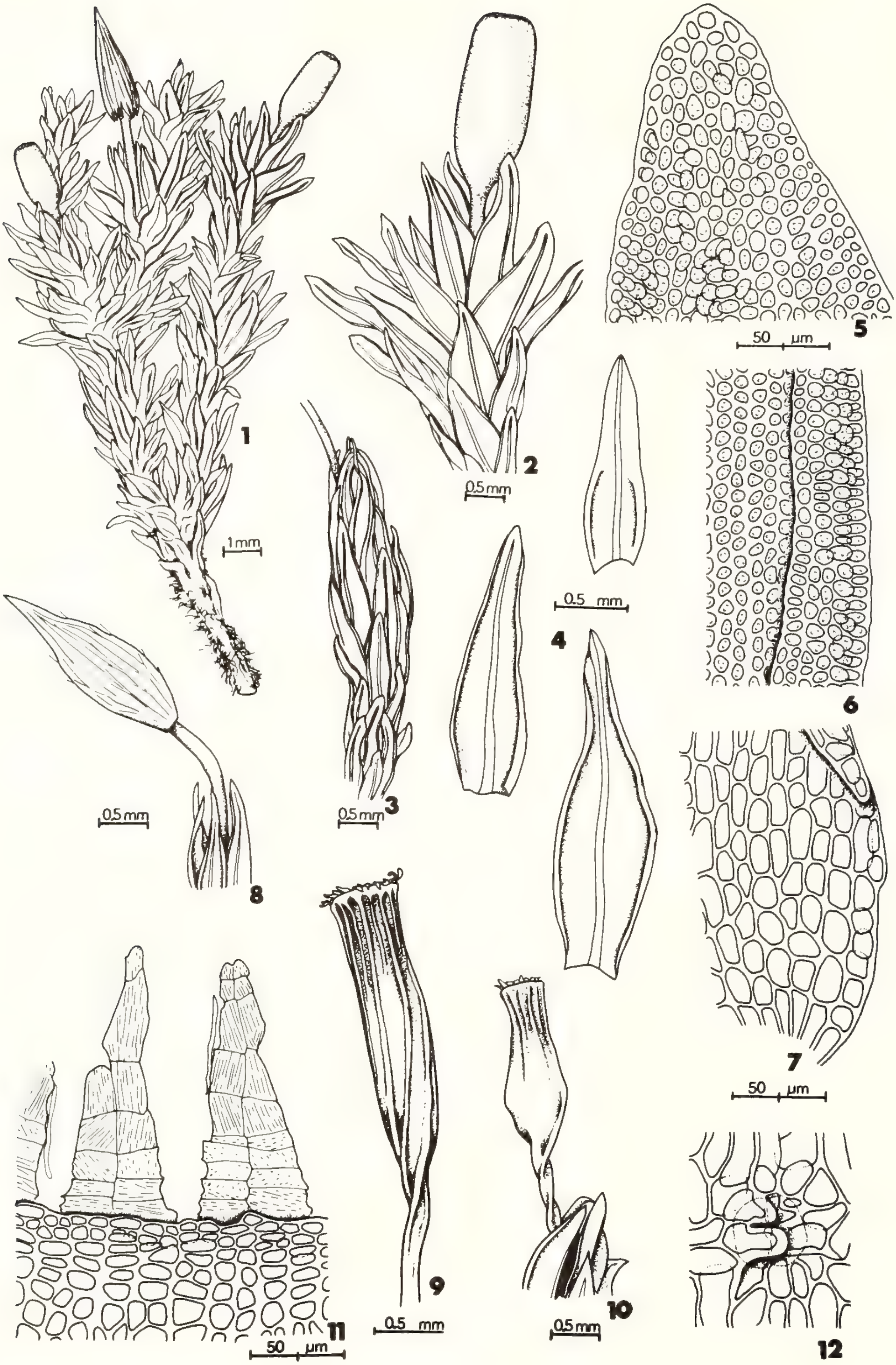
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Plate 225. *Orthotrichum anomalum*. 1. Habit. 2. Portion of stem with capsule (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Calyptrate capsule (dry). 9–10. Capsules (dry). 11. Peristome teeth. 12. Stoma.

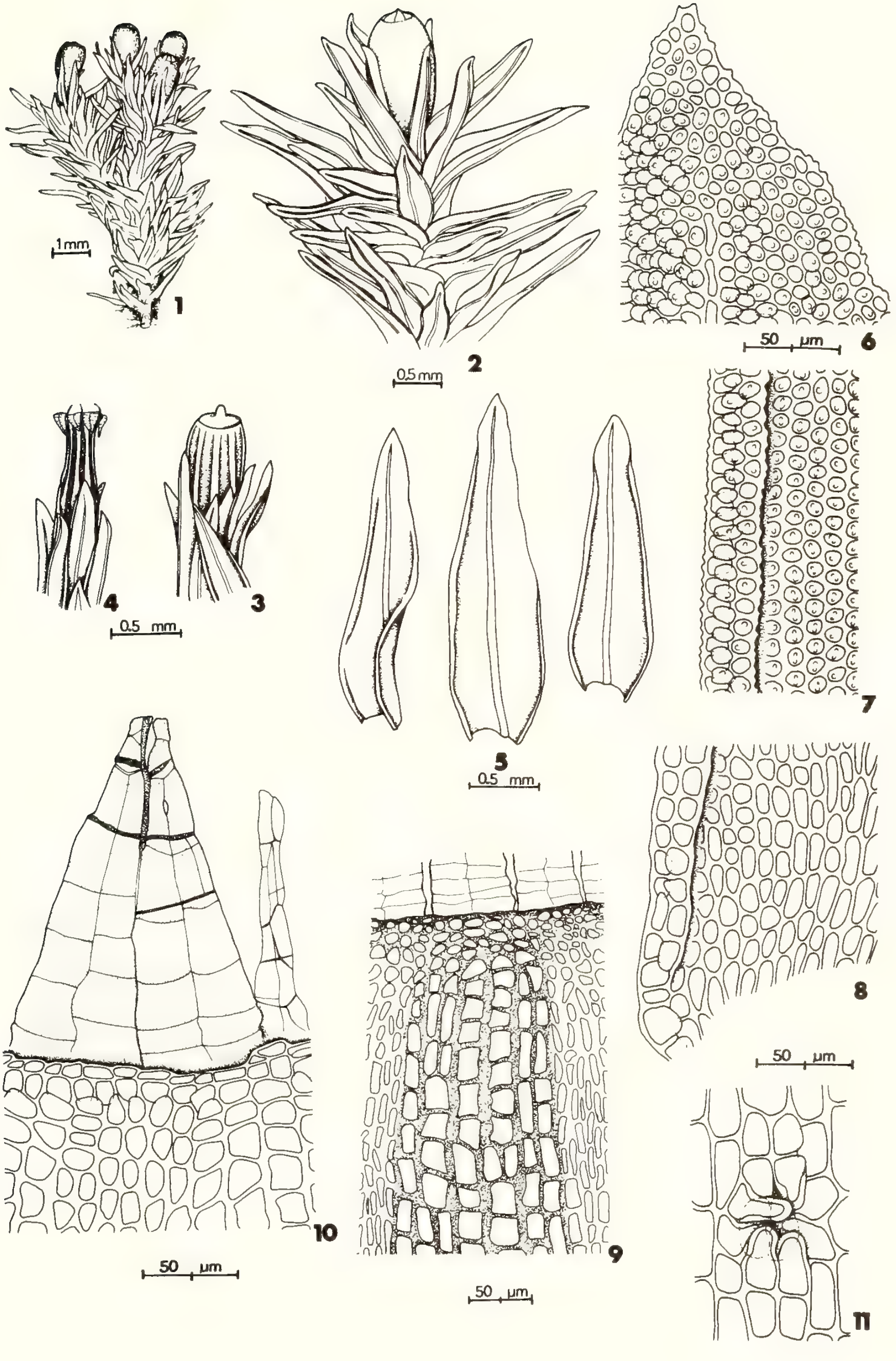
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Plate 226. *Orthotrichum stellatum*. 1. Habit. 2. Portion of stem with capsule (wet). 3–4. Portion of stems with capsules (dry). 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Exothecial cells of rib. 10. Peristome teeth. 11. Stoma.

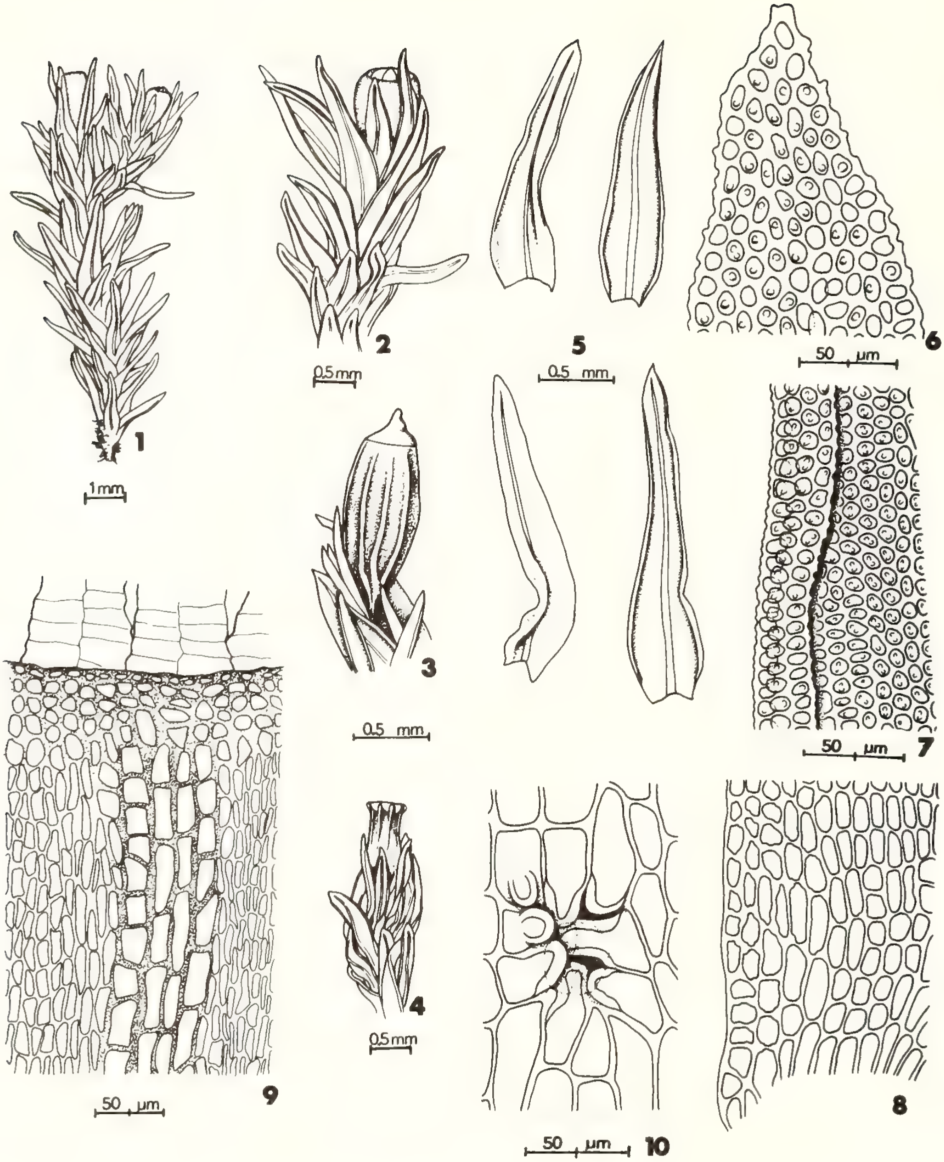
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Plate 227. *Orthotrichum ohioense*. 1. Habit. 2. Portion of stem with capsule (wet). 3–4. Portion of stems with capsules (dry). 5. Leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Exothecial cells of rib. 10. Stoma.

4. **Ulota** Mohr *ex* Web., Ann. Bot. 2: 540. 1806.

Habit: In erect, dense, often rounded tufts.

Colour: Green, yellowish green or brownish above, brown to blackish below.

Stems: 0.5–3.0 cm high, erect, simple or forked, rhizoids at base and often among leaves.

Leaves: Erect-spreading, straight to crisped when dry, keeled, unistratose, linear-lanceolate, lanceolate, or ovate-lanceolate, acute, the base often broad and concave, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane or recurved near middle, entire or crenulate near apex.

Costae: Single, subpercurrent to shortly excurrent, prominent on dorsal surface.

Leaf Cells: Smooth below, unipapillose above on both surfaces, the walls thick, sometimes pitted below. Median cells round, elliptic or irregularly rounded, becoming longer near base.

Asexual Reproductive Bodies: Lacking or present, brown, uniseriate gemmae, 3–9 cells, produced in clusters on the excurrent costa.

Sex: Autoicous or dioicous.

Calyptrae: Mitrate, with a few hairs, yellowish with a reddish tip.

Capsules: Solitary, exserted, on a seta arising from stem apex or a short branch below, brown, cylindric, urceolate or pyriform, tapering to a long neck, straight, erect, smooth, 8-ribbed or puckered at mouth when dry, stomata superficial, confined to neck.

Setae: Straight to somewhat flexuose, smooth, twisted when dry, brown.

Annuli: Lacking.

Opercula: Rostrate, beak straight or arcuate.

Peristomes: Double, 16 exostome teeth, lanceolate, united in pairs, 8 endostome segments, linear, shorter than exostome.

Spores: Yellow to yellowish brown, globose to ellipsoidal, papillose, 10–24 μm in longest dimension.

1. Leaves strongly crisped when dry 2
    2. Gemmae in clusters at leaf apices; maritime plants growing on rocks or trees in spray zone .... 1. *U. phyllantha*
    2. Gemmae lacking; plants growing on trees inland .... 4. *U. crispa*
1. Leaves straight, curved or twisted, but not crisped when dry 3
    3. Plants occurring on trees; capsules pyriform, with a small, puckered mouth when dry .... 2. *U. coarctata*
    3. Plants occurring on rock; capsules cylindric, without a puckered mouth .... 3. *U. hutchinsiae*

1. Ulota phyllantha Brid., Mant. Musc. 113. 1819.
PLATE 228

Easily recognized from the other *Ulota* species by the leaves that are strongly crisped when dry, bearing clusters of propagula at the leaf apices, and by its maritime habit, growing on rocks or trees in the spray zone. The plants from the Maritimes have never been found with sporophytes.

Habitat: On trees and rocks in the ocean spray zone.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Restigouche); Nova Scotia (Cape Breton, Kings, Victoria, Yarmouth).

Range: A maritime species occurring on the East Coast from Labrador, Newfoundland, Nova Scotia, New Brunswick, Quebec, Maine, and on the West Coast from Alaska, British Columbia, Washington, Oregon, and California. South America, Europe, *Africa.

Chromosome Number: Unreported.

Remarks: Sporophyte drawn from British Columbia plants.

2. Ulota coarctata (P. Beauv.) Hammar, Mon. Orthotr. Ulota Suec. 25. 1852.
Orthotrichum coarctatum P. Beauv., Prodr. 80: 1805.
[Synonym: *U. ludwigii* (Brid.) Brid.]
PLATE 229

Plants with leaves straight, slightly curved or twisted (not crisped when dry), usually producing numerous capsules that are pyriform with a small, puckered mouth when dry and occurring on trees.

Habitat: On tree trunks and limbs.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Queen's, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Labrador to Ontario, south to North Carolina and Tennessee. Europe.

Chromosome Number: n = 10.

3. **Ulota hutchinsiae** (Sm.) Hammar, Mon. Orthogr. Ulota Suec. 27. 1852.
Orthotrichum hutchinsiae Sm., Engl. Bot. 36: 2523. 1813.
[Synonym: *U. americana* (P. Beauv.) Limpr.]
PLATE 230

Plants with leaves straight, slightly curved or twisted (not crisped when dry), producing capsules that are cylindric, without a puckered mouth, and occurring on noncalcareous rock.

Habitat: On noncalcareous rock.

Maritime Distribution: Frequent. New Brunswick (Queen's, York); Nova Scotia (Annapolis, Colchester, Halifax, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth).

Range: Newfoundland to Ontario, south to North Carolina, Tennessee, and Arkansas; disjunct to Arizona, *Alberta, and *British Columbia. Europe, *Asia.

Chromosome Number: n = 10, 16.

4. **Ulota crispa** (Hedw.) Brid., Mant. Musc. 112. 1819.
Orthotrichum crispum Hedw., Spec. Musc. 162. 1801.
PLATE 231

Plants with leaves strongly crisped when dry, lacking propagula, generally producing numerous sporophytes, and occurring on trees inland.

Habitat: On tree trunks and limbs.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Queen's, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Newfoundland to *Saskatchewan, south to North Carolina, *Georgia, and Tennessee. Europe, Asia, *Africa.

Chromosome Number: n = 11, 12, 21, 22.

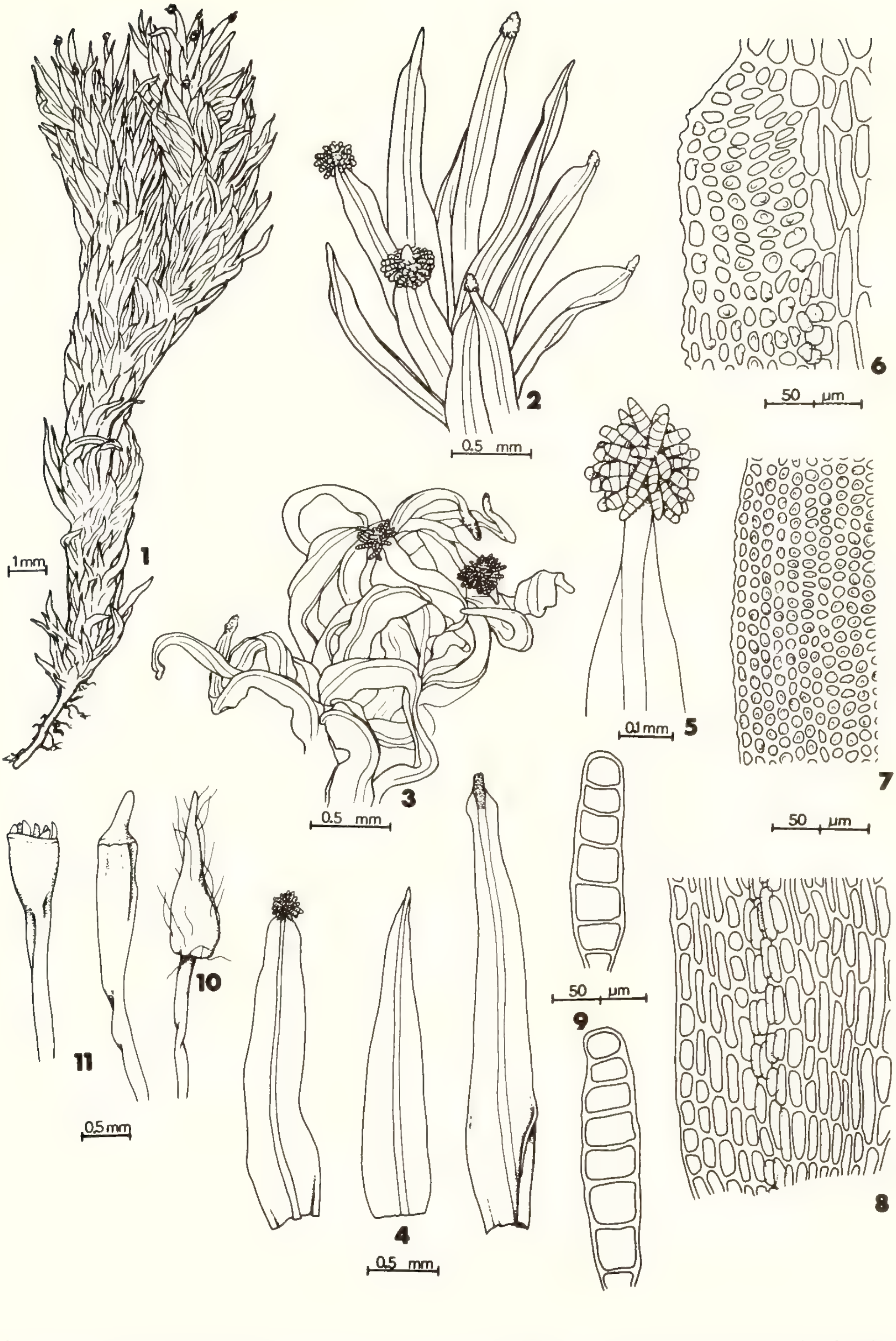
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Plate 228. *Ulota phyllantha*. 1. Habit. 2. Portion of stem showing gemmae at leaf apices (wet). 3. Portion of stem (dry). 4. Leaves. 5. Enlargement of leaf apex bearing gemmae. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Gemmae. 10. Calyptrate capsule (dry). 11. Capsules (dry).

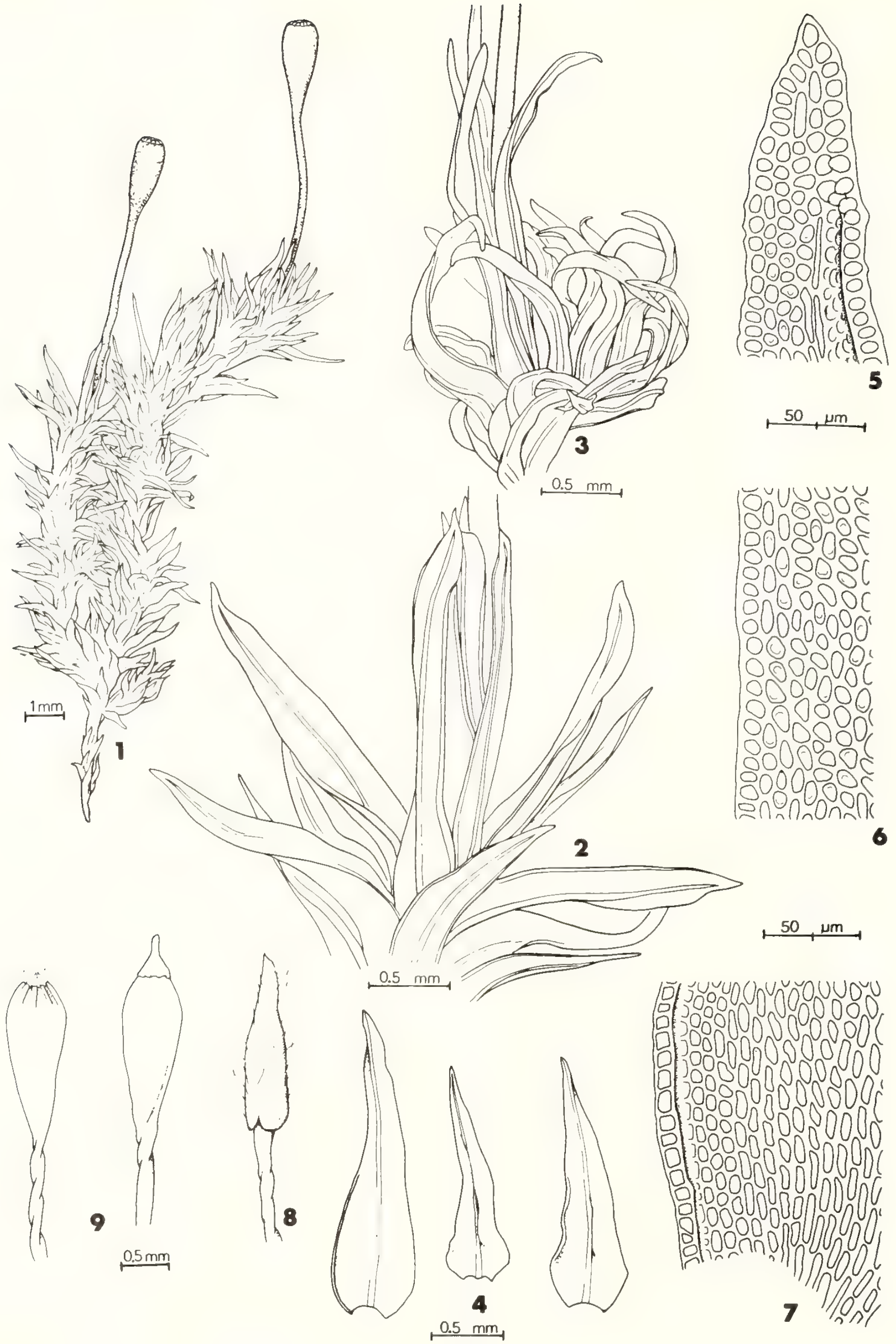
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Plate 229. *Ulota coarctata*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Calyptrate capsule (dry). 9. Capsules (dry).

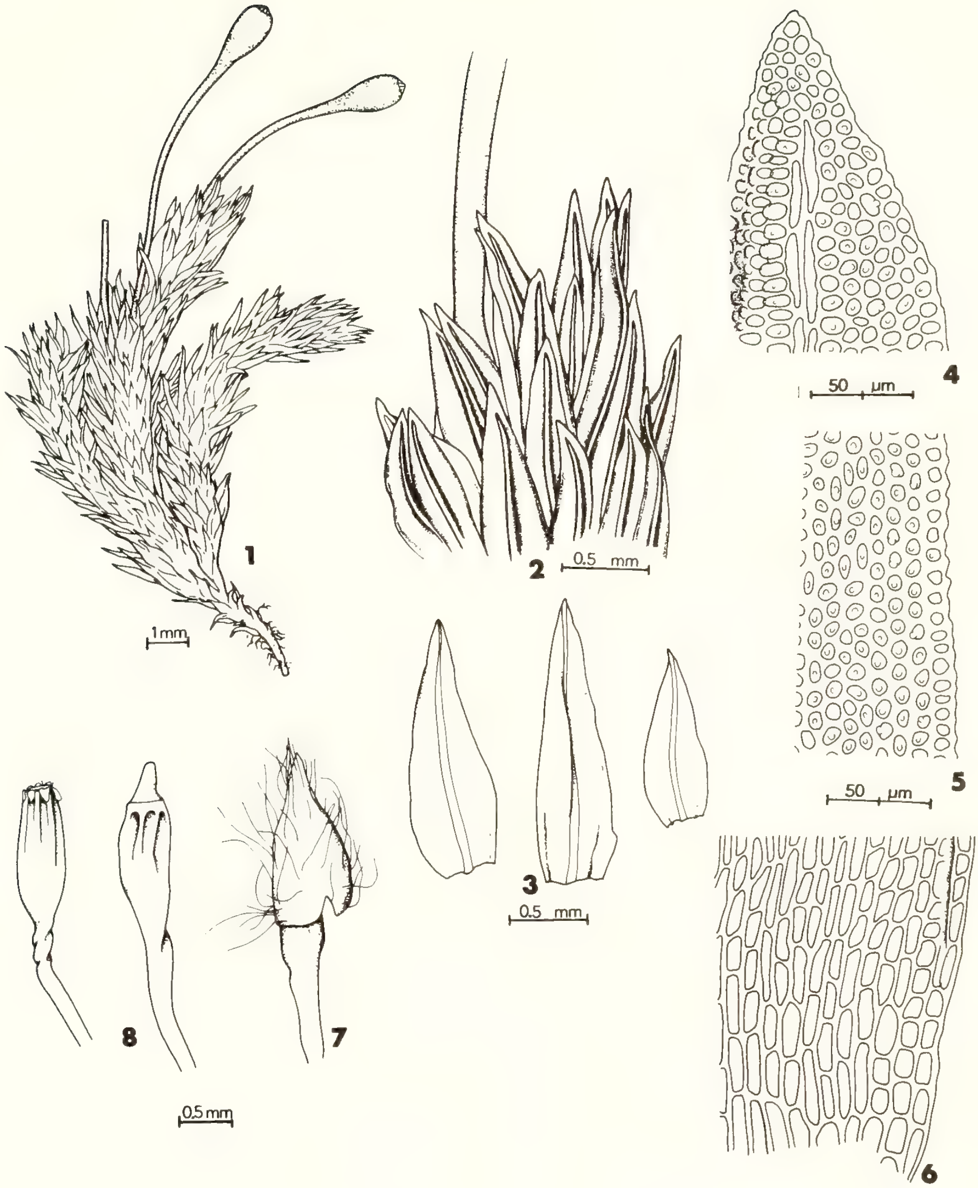
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Plate 230. *Ulota hutchinsiae*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Calyptrate capsule (dry). 8. Capsules (dry).

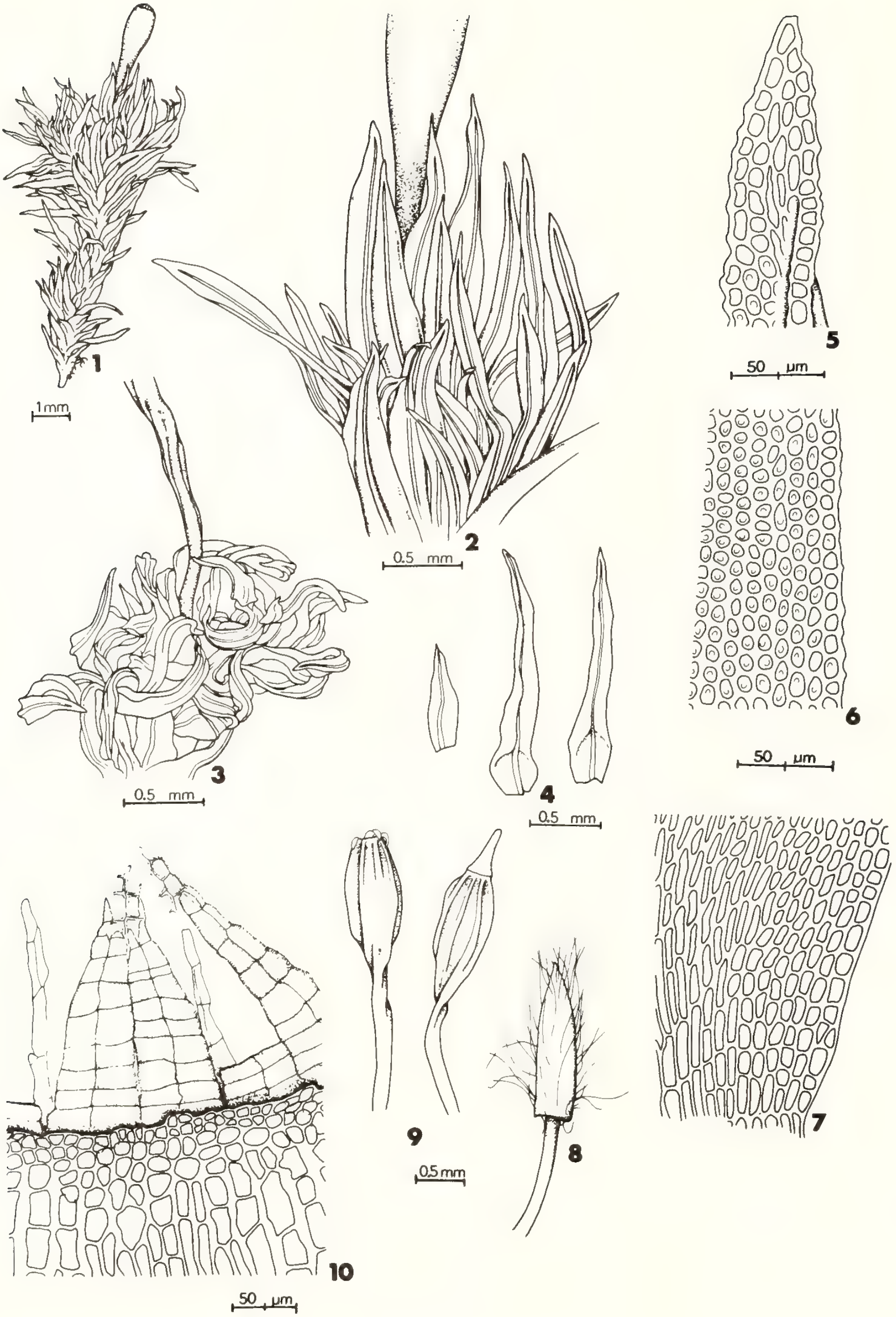
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Plate 231. *Ulota crispa*. 1. Habit. 2. Portion of stem (wet). 3. Portion of stem (dry). 4. Leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Calyptrate capsule (dry). 9. Capsules (dry). 10. Peristome teeth.

5. **Drummondia** Hook. *ex* Drumm., Musci Bor. Amer. n. 62. 1828. *nom. cons.*

Habit: Creeping, with numerous, erect branches.

Colour: Green to yellowish green, brownish green with age.

Stems: Primary stems creeping, branches numerous, erect, 2–6 mm high, simple or often forked, rhizoids on primary stems and at base of branches.

Leaves: Primary stem leaves spreading to squarrose, appressed and contorted when dry, ovate to ovate-lanceolate, acuminate, branch leaves erect to arcuate, appressed, little changed when dry, keeled, unistratose or bistratose above on margins, oblong or lanceolate, acute to obtuse, nondecurrent. Perichaetial leaves undifferentiated.

Leaf Margins: Plane, entire throughout, unistratose or sometimes bistratose near apex.

Costae: Single, subpercurrent to percurrent, prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick, lacking pits. Median cells round, elliptic or irregularly rounded, becoming larger and elongate near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, exserted, on a seta arising from stem apex, brown, ovoid, erect, smooth, wrinkled when dry, stomata lacking.

Setae: Straight, smooth, not or little twisted when dry, brown.

Annuli: Lacking.

Opercula: Long-rostrate, straight or slightly arcuate.

Peristomes: Single, consisting of 16 smooth teeth, truncate, rudimentary, yellowish brown.

Spores: Yellow to yellowish brown, globose to ovoid, multicellular, papillose, 70–130 µm in longest dimension.

Vitt (1972) monographed the genus *Drummondia* on a worldwide basis.

1. **Drummondia prorepens** (Hedw.) Britt., Mem. Torrey Bot. Cl. 4: 180. 1894.
Gymnostomum prorepens Hedw., Spec. Musc. 35. 1801.
[Synonyms: *D. clavellata* (Hook. & Grev.) Hook. *ex* Drumm.; *D. clavellata* var. *canadensis* Kindb. *ex* Mac. & Kindb.]
PLATE 232

Primary stems creeping, with numerous, erect branches, branch leaves erect to arcuate, appressed, oblong or lanceolate, acute to obtuse, costae subpercurrent; capsules exserted, ovoid, erect, peristome single, of 16 rudimentary teeth, spores multicellular.

Habitat: On tree trunks.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Hants, Queens).

Range: Nova Scotia to southern Ontario, south to North Carolina, Tennessee, Mississippi, Arkansas, and Oklahoma. Asia.

Chromosome Number: Unreported.

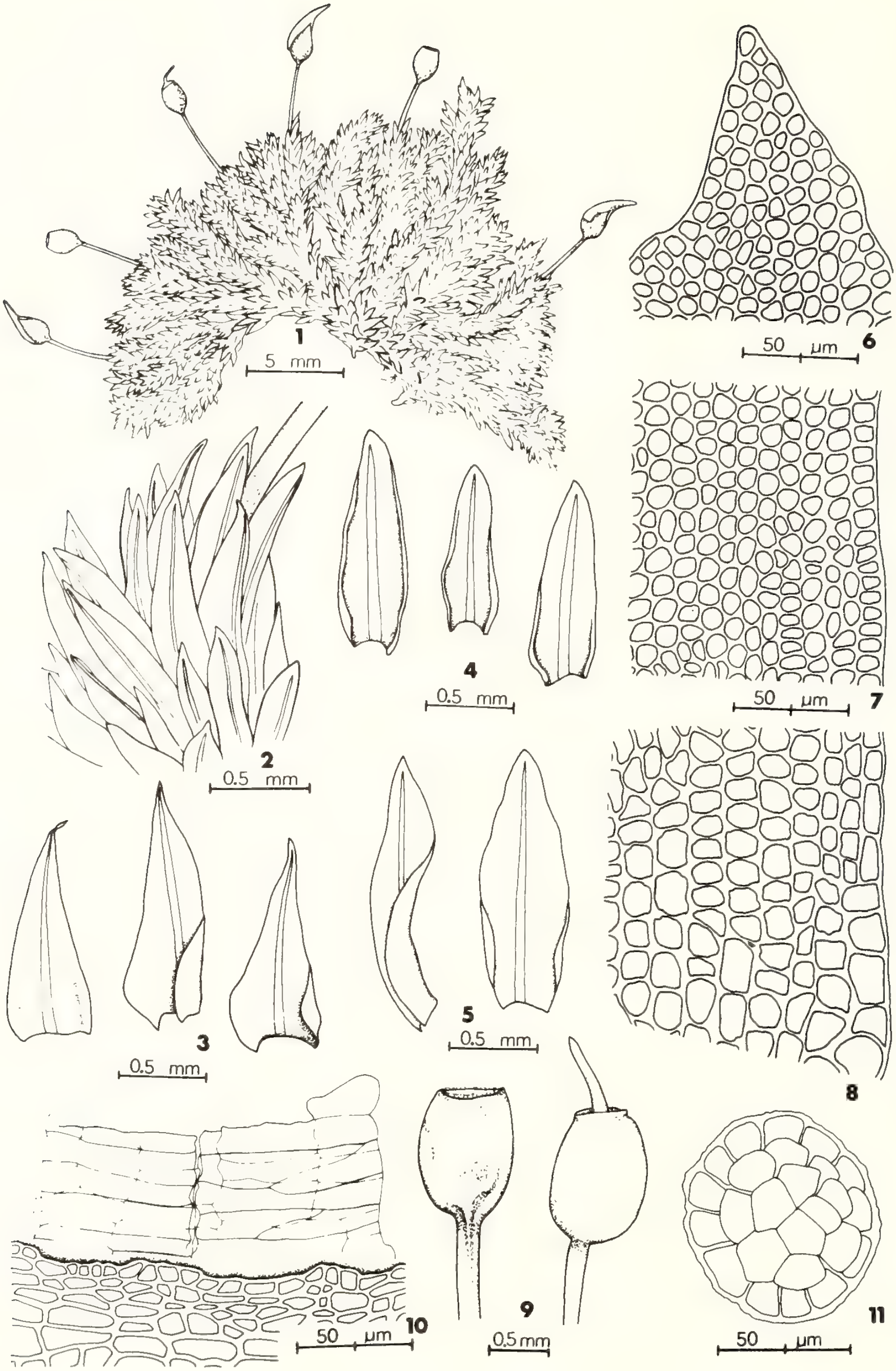
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Plate 232. *Drummondia prorepens*. 1. Habit. 2. Portion of stem. 3. Primary stem leaves. 4. Upper leaves of secondary stem. 5. Lower leaves of secondary stem. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth. 11. Spore.

Family HEDWIGIACEAE

Hedwigia P. Beauv., Mag. Enc. 5: 304. 1804. *nom. cons.*

Habit: In prostrate or decumbent, loose mats.
Colour: Yellowish to brownish green, hoary.
Stems: 2–8 cm long, wiry, prostrate to decumbent, irregularly branched, rhizoids at base.
Leaves: Erect-spreading to spreading, imbricate when dry, concave, unistratose, ovate to ovate-lanceolate, acute to acuminate, usually ending in a short, hyaline, spinulose tip that is spreading when dry, non-decurrent. Perichaetial leaves longer than other leaves, long, hyaline, nodose or toothed cilia along upper margins.
Leaf Margins: Recurved in lower half, sometimes nearly to hyaline tip, entire below, becoming spinulose above near hyaline tip.
Costae: Lacking.
Leaf Cells: Papillose, 1–2, rarely more, simple or branched papillae on both surfaces, thick-walled, basal cells near center of leaf pitted. Median cells quadrate to elongate, alar cells quadrate to rectangular, becoming elongate toward center of leaf.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous.
Calyptrae: Cucullate or mitrate, hairy, fugacious.
Capsules: Solitary or rarely 2 per perichaetium, immersed, on a short seta arising from stem or branch tips, light brown, reddish brown around mouth, globose to ovoid, with a short neck that is longitudinally wrinkled when dry.
Setae: Short, straight, smooth, brown.
Annuli: Lacking.
Opercula: Convex, apiculate.
Peristomes: Lacking.
Spores: Yellow to brownish, globose to three-angled, reticulate, 19–28 μm in longest dimension.

1. **Hedwigia ciliata** (Hedw.) P. Beauv., Prodr. 15. 1805.
Anictangium ciliatum Hedw., Spec. Musc. 40. 1801.
[Synonym: *H. albicans* Lindb.]
PLATE 233

Plants yellowish to brownish green, hoary, stems wiry, irregularly branched, to 8 cm long; leaves imbricate with spreading tips when dry, ovate to ovate-lanceolate, acute to acuminate, usually ending in a short, hyaline, spinulose tip, margins often recurved below, ecostate, 1.0–2.5 mm long, leaf cells with 1–2, rarely more, simple or branched papillae on both surfaces, thick-walled, subquadrate to elongate above, elongate below, alar cells quadrate to rectangular; capsules immersed, globose to ovoid, with a short neck, lacking peristome, surrounded by long, perichaetial leaves with long, hyaline hairs in upper half.

Habitat: On dry, exposed, noncalcareous boulders and cliffs.
Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Madawaska, Queen's, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria).
Range: Throughout most of North America but apparently absent from Prince Edward Island and the Arctic Archipelago. Central and South America, Europe, Asia, *Africa, *Australia, New Zealand.
Chromosome Number: n = 10, 11, 22.
Remarks: The genus is named for Johann Hedwig, a German bryologist, whose 1801 book *Species Muscorum* is the starting date of moss nomenclature (except for *Sphagnum* which starts in 1753 with Linnaeus' *Species Plantarum*).

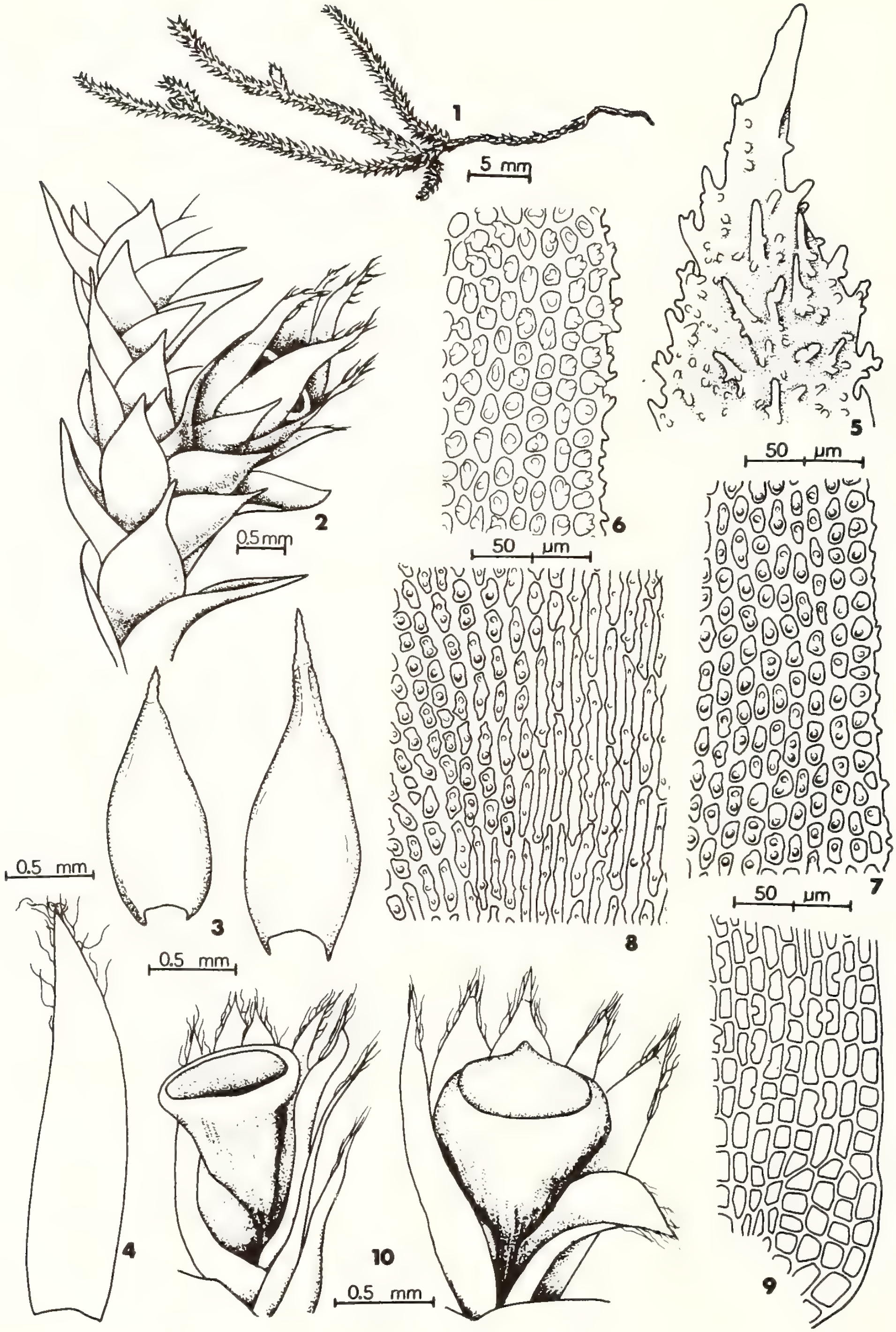
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Plate 233. *Hedwigia ciliata*. 1. Habit. 2. Portion of stem with perichaetial leaves and capsule. 3. Leaves. 4. Perichaetial leaf. 5. Enlargement of hyaline leaf apex. 6–9. Leaf cells (6, apical. 7, median-marginal. 8, basal. 9, alar.). 10. Capsules with perichaetial leaves, operculate (wet), inoperculate (dry).

Family LEUCODONTACEAE

Leucodon Schwaegr., Spec. Musc. Suppl. 1(2): 1. 1816.

Habit: In prostrate, rigid mats.

Colour: Green, yellowish green, brownish green, or yellowish brown, dull.

Stems: Primary stems slender, almost filiform, radiculose, secondary stems 1.5–6.0 cm long, suberect or horizontal, curved when dry, simple or sparsely branched, usually terete.

Leaves: Secondary stem leaves erect- to wide-spreading, appressed or erect to subsecund when dry, concave, unistratose, ovate to ovate-lanceolate, acute to acuminate, shortly decurrent. Perichaetial leaves ecostate, acuminate, convolute, long-sheathing.

Leaf Margins: Plane or reflexed to revolute to middle, entire or serrulate at apex.

Costae: Lacking.

Leaf Cells: Smooth, the walls thick, lower cells pitted, upper cells with few pits. Median cells fusiform, becoming shorter towards apex and longer near base, upper marginal cells shortly oblong-rhomboidal, transversely oblong near base, basal cells often yellow.

Asexual Reproductive Bodies: Lacking or present near apices of secondary stems, few to many, flagelliform branchlets clustered in leaf axils.

Sex: Dioicous (inflorescences unknown in *L. brachypus* var. *andrewsianus*).

Calyptrae: Cucullate, clasping tip of seta until maturity, naked, yellowish.

Capsules: Solitary, emergent to slightly exserted, on a seta arising from the middle of secondary stems, yellowish brown to brown, oblong-cylindric, straight, narrow at mouth, erect, smooth.

Setae: Straight, smooth, not twisted when dry, yellow- to red-brown, partially or completely hidden in perichaetial leaves.

Annuli: Lacking.

Opercula: Conic-rostrate, straight to somewhat curved.

Peristomes: Double, 16 exostome teeth, lanceolate, papillose, inserted below the mouth, whitish, endostome rudimentary, sometimes apparently lacking.

Spores: Yellow to yellowish brown, globose, densely and finely papillose, 14–24 μm.

1. Secondary stems lacking flagelliform branchlets; leaves acute to short-acuminate .... 1. *L. brachypus*
1. Secondary stems often bearing numerous flagelliform branchlets in leaf axils; leaves long-acuminate .... 1a. *L. brachypus* var. *andrewsianus*

1. Leucodon brachypus Brid., Bryol. Univ. 2: 210. 1827.

PLATE 234

Plants prostrate, irregularly branched, secondary branches ascending, terete and arcuate when dry, leaves close, plicate, ovate to ovate-lanceolate, acute to short-acuminate, 1.5–2.5 mm long, margins plane or reflexed to revolute to leaf middle, entire or serrulate at apex, leaf cells smooth, median cells fusiform; dioicous, capsules emergent to slightly exserted, oblong-cylindric.

Habitat: On tree trunks.

Maritime Distribution: Rare. New Brunswick (Charlotte); Nova Scotia (Digby, Halifax).

Range: Endemic to North America, occurring from Nova Scotia to *Ontario, south to Georgia, Alabama, and Illinois; also in Arizona.

Chromosome Number: n = 10.

1a. Leucodon brachypus var. **andrewsianus** Crum & Anderson, Bryologist 75(1): 101. 1972.

PLATE 235

Similar to var. *brachypus* but sex organs and sporophytes are unknown on Maritime plants. The plants reproduce asexually by numerous flagelliform branchlets that occur in the leaf axils on the secondary stems, usually near the apices. The only other apparent difference is the leaves that are long-acuminate.

Habitat: On tree trunks and rotten logs, rarely on rock (shale).

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Madawaska, Queen's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Hants, Inverness, Kings, Shelburne, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Endemic to North America, from Newfoundland to Ontario, south to North Carolina and Michigan.

Chromosome Number: Unreported.

Remarks: Maritime reports of *Leucodon sciuroides* (Hedw.) Schwaegr., as well as those throughout North America, are based on misidentified specimens that are usually *L. brachypus* var. *andrewsianus*.

Sporophytes were recently found on North Carolina plants and they are reportedly (Crum and Anderson, 1981) similar to those of the var. *brachypus*.

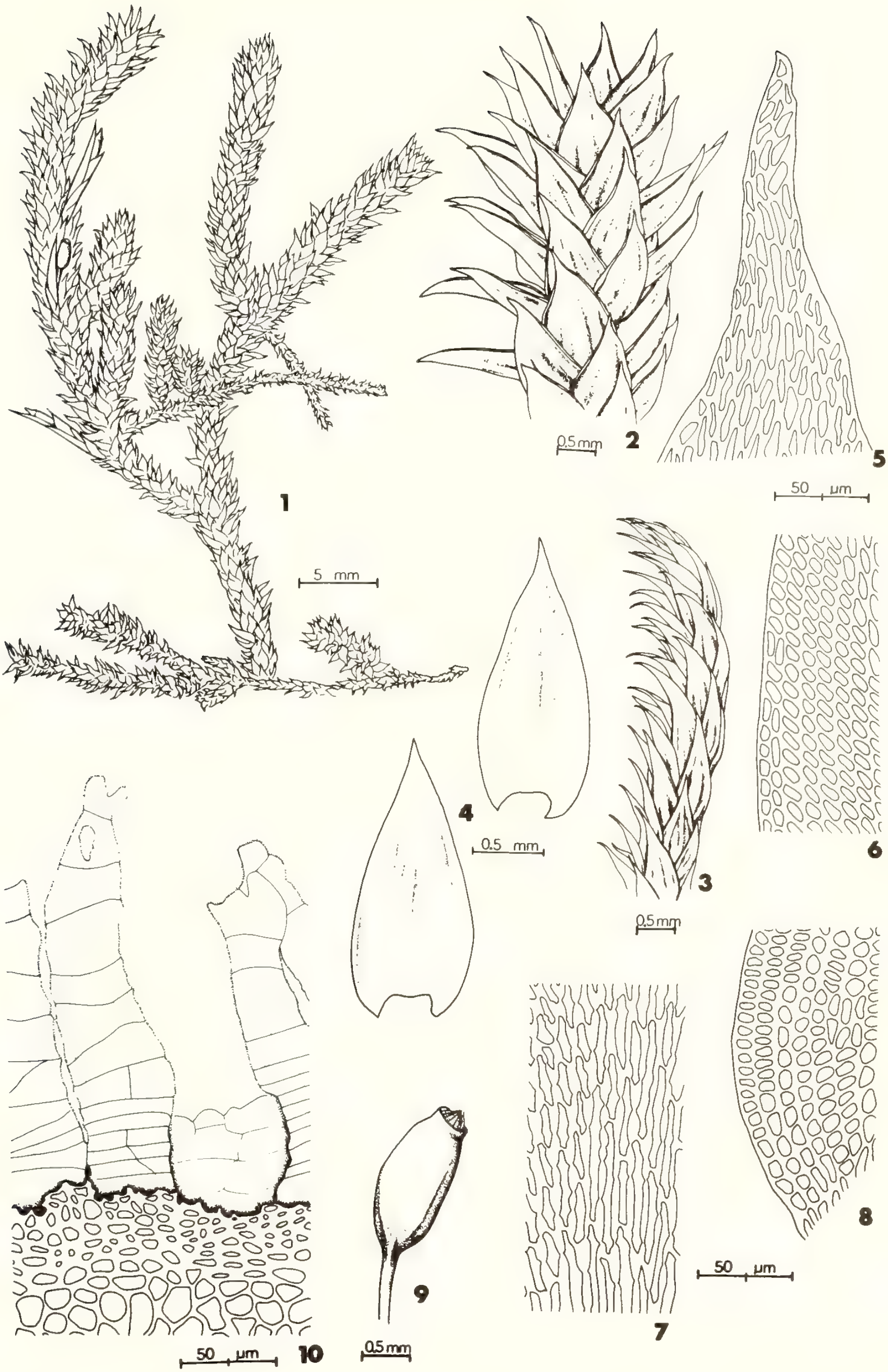
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Plate 234. *Leucodon brachypus*. 1. Habit. 2. Portion of branch (wet). 3. Portion of branch (dry). 4. Leaves. 5–8. Leaf cells (5, apical. 6, median-marginal. 7, median below middle of leaf. 8, alar.). 9. Capsule (dry). 10. Peristome teeth.

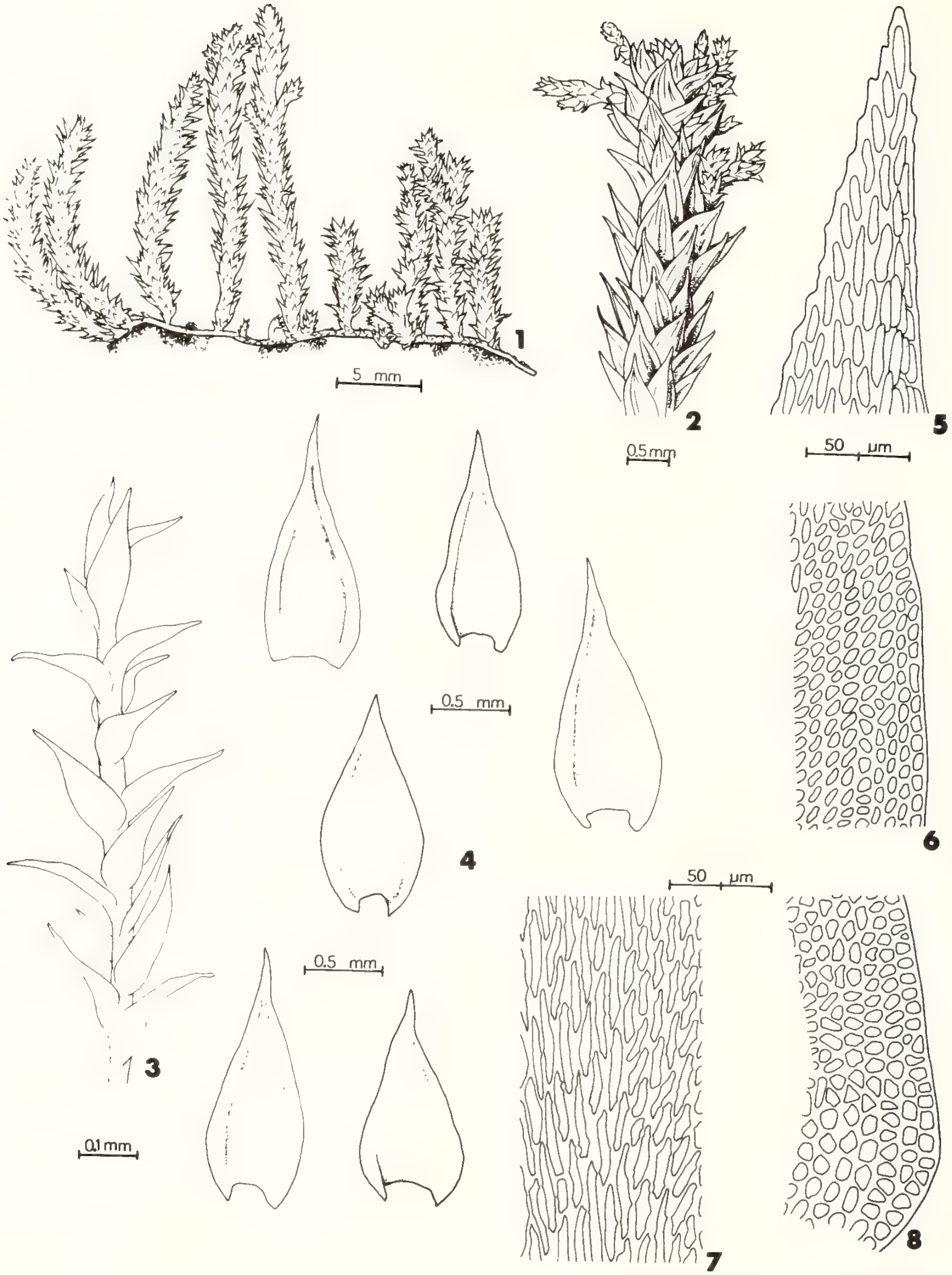
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Plate 235. *Leucodon brachypus* var. *andrewsianus*. 1. Habit. 2. Portion of branch with flagelliform branchlets. 3. Apical portion of flagelliform branchlet. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median-marginal. 7, median below middle of leaf. 8, alar.).

Family FONTINALACEAE

1. Leaves broad, lanceolate to broadly ovate; ecostate .... 1. *Fontinalis* (p. 415)
1. Leaves narrow, linear-lanceolate to lanceolate; costae single .... 2. *Dichelyma* (p. 425)

Welch (1960) monographed the family on a worldwide basis.

1. **Fontinalis** Hedw., Spec. Musc. 298. 1801.

Habit: Aquatic plants in prostrate, loose mats.

Colour: Green, yellowish green, brownish green or yellowish brown, becoming brown or black below, dull to glossy.

Stems: 5–50 cm long, prostrate, irregularly pinnately branched, denuded below, rhizoids at base.

Leaves: In 3 rows, erect to spreading, scarcely altered when dry, plane, concave or strongly keeled, unistratose, basal cells near insertion often bistratose, lanceolate to ovate, rarely suborbicular, acute to acuminate, sometimes obtuse, nondecurrent or decurrent, sometimes auriculate. Perichaetial leaves ecostate, obtuse, convolute, sheathing capsule.

Leaf Margins: Plane or involute, sometimes recurved at base, entire or serrulate to serrate at apex, entire below.

Costae: Lacking.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits or with a few pits in basal cells. Median cells linear or rhomboidal, becoming wider and broader at base and apex, a few enlarged or inflated cells in 1–2 layers in alar region and inward.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Mitrate, naked, yellowish.

Capsules: Solitary, immersed to emergent, on a short seta arising from lower part of stem, yellow to brown, cylindrical to ovoid, straight, erect, smooth, wrinkled at neck when dry.

Setae: Short, straight, smooth, not or little twisted when dry, hidden in perichaetial leaves.

Annuli: Lacking.

Opercula: Conic, beak straight.

Peristomes: Double, 16 exostome teeth shorter than endostome, linear or linear-lanceolate, yellowish, yellowish brown or orange, 16 endostome segments united by transverse bars to form trellis-like cone.

Spores: Green to yellow or yellowish brown, globose, smooth to minutely papillose, 10–34 μm.

A difficult genus of aquatic mosses that was monographed by Welch (1960). Species of *Fontinalis* are sometimes called "Water Moss" or "Brook Moss".

1. Plants often yellowish to brownish green; leaves keeled 2
    2. Leaves longer than broad, 2–3:1, seldom reaching 4 mm wide .... 1. *F. antipyretica*
    2. Leaves about as broad as long, 1.0–1.5:1, often over 4 mm wide .... 1a. *F. antipyretica* var. *gigantea*
1. Plants usually green; leaves plane or concave 3
    3. Leaves plane 4
        4. Leaves obtuse to truncate, serrate at apices .... 6. *F. flaccida*
        4. Leaves acute, entire or serrulate at apices .... 5. *F. hypnoides*
    3. Leaves concave 5
        5. Leaves rigid, appressed to slightly spreading .... 2. *F. dalecarlica*
        5. Leaves flaccid, spreading, seldom appressed 6
            6. Leaf margins often involute .... 3. *F. novae-angliae*
            6. Leaf margins not involute .... 4. *F. sullivantii*

1. **Fontinalis antipyretica** Hedw., Spec. Musc. 298. 1801.

PLATE 236

Plants yellowish to brownish green with strongly keeled leaves, 3–5 mm long, 2–4 mm wide.

Habitat: On boulders in creeks and ponds.

Maritime Distribution: Rare. Nova Scotia (Colchester, Victoria).

Range: *Greenland to Alaska, south to *Pennsylvania, Michigan, *Minnesota, *New Mexico, Utah, and California. Europe, Asia, *Africa.

Chromosome Number: n = 11.

Remarks: *Fontinalis antipyretica*, whose name means "against fire", was used by peasants in Scandinavia to pack in the space between their stoves and wooden walls, thereby taking advantage of the moss's supposedly nonflammable properties.

1a. **Fontinalis antipyretica** var. **gigantea** (Sull.) Sull., Icones Musc. 106. 1864.

Fontinalis gigantea Sull., Musci Hep. U.S. 104. 1856.

PLATE 237

Similar to var. *antipyretica* except with very broad leaves, often 4–6 mm wide.

Habitat: Attached to rocks in running water in creeks and rivers.

Maritime Distribution: Common. New Brunswick (Kent, King's, Northumberland, Victoria, Westmorland, York); Nova Scotia (Antigonish, Cape Breton, Colchester, Halifax, Inverness, Kings, Pictou, Victoria); Prince Edward Island (Queens).

Range: Labrador to Ontario, south to *Delaware, Pennsylvania, *Ohio, Wisconsin, and *Minnesota; also in British Columbia, Colorado, Washington, and California. Europe, *Africa.

Chromosome Number: Unreported.

2. **Fontinalis dalecarlica** Schimp. *ex* B.S.G., Bryol. Eur. 5: 9. 431. 1846 (fasc. 31 Mon. 7.1).

[Synonym: *F. seriata* Lindb.]

PLATE 238

Plants green, leaves concave, rigid, appressed to slightly spreading.

Habitat: On rocks, twigs and logs in running water of creeks and rivers.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Guysborough, Halifax, Inverness, Pictou, Queens, Shelburne, Victoria, Yarmouth).

Range: *Greenland to Alberta, south to *Florida, Tennessee, *Minnesota, and Montana. Europe, *Asia.

Chromosome Number: Unreported.

3. **Fontinalis novae-angliae** Sull., Musci Hep. U.S. 104. 1856.

[Synonyms: *F. cardotii* (Ren.) Card.; *F. delamarei* Ren. & Card.; *F. lescurii* Sull.; *F. novae-angliae* var. *cymbifolia* (Aust.) Welch; *F. novae-angliae* var. *delamarei* (Ren. & Card.) Welch]

PLATE 239

Plants green, leaves concave, flaccid, spreading, margins often involute.

Habitat: On rocks in flowing water in creeks and rivers or at margins of lakes.

Maritime Distribution: Common. New Brunswick (Carleton, Charlotte, York); Nova Scotia (Annapolis, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Richmond, Shelburne, Victoria, Yarmouth, Sable Island, St. Paul Island).

Range: Endemic to North America, from Newfoundland to *British Columbia (?), south to Florida, Louisiana, and Oklahoma.

Chromosome Number: Unreported.

4. **Fontinalis sullivantii** Lindb., Oefv. Finsk. Vet. Soc. Foehr. 12: 78. 1870.

[Synonym: *F. disticha* Hook. & Wils. *ex* Drumm.]

PLATE 240

Similar to *F. novae-angliae* but differing mainly by the leaf margins that are not involute.

Habitat: On boulders in river.

Maritime Distribution: Rare. Nova Scotia (Shelburne). Collected along Roseway River, 3.2 km north of Upper Ohio, ca. 43°59′N, 65°26′W, 28 July 1968 (*Ireland 12212*).

Range: Endemic to North America, from Nova Scotia to *Ontario, south to *Florida and *Louisiana; also in *British Columbia (?).

Chromosome Number: Unreported.

5. Fontinalis hypnoides C.J. Hartm., Handb. Skand. Fl. ed. 4: 434. 1843.
[Synonym: *F. duriaei* Schimp.]
PLATE 241

Plants green, leaves plane, sometimes auriculate at base, apices acute, entire or serrulate.

Habitat: On rocks and twigs in creeks and rivers.

Maritime Distribution: Rare. New Brunswick (Restigouche, Victoria); Nova Scotia (Pictou, Victoria).

Range: Nova Scotia to British Columbia, south to *Connecticut, Ohio, Indiana, Missouri, Texas, Colorado, Utah, and California. *Mexico, *South America, Europe, Asia, *Africa.

Chromosome Number: Unreported.

Remarks: Larger plants, with leaves often 1.5 mm wide or more, have been referred to *F. duriaei* Schimp. but many intergradations in leaf size were found which led to placing the species in synonymy.

6. Fontinalis flaccida Ren. & Card., Bot. Gaz. 13: 201. 1888.
PLATE 242

Plants green, leaves plane, sometimes auriculate at base, apices obtuse to truncate, serrate.

Habitat: In brook.

Maritime Distribution: Rare. Nova Scotia (Shelburne). Collected on Cape Sable Island, 6 July 1910 (*Macoun 202*, NY).

Range: Endemic to eastern North America, from Newfoundland to *Ontario, south to Florida and Louisiana; also in *British Columbia?

Chromosome Number: Unreported.

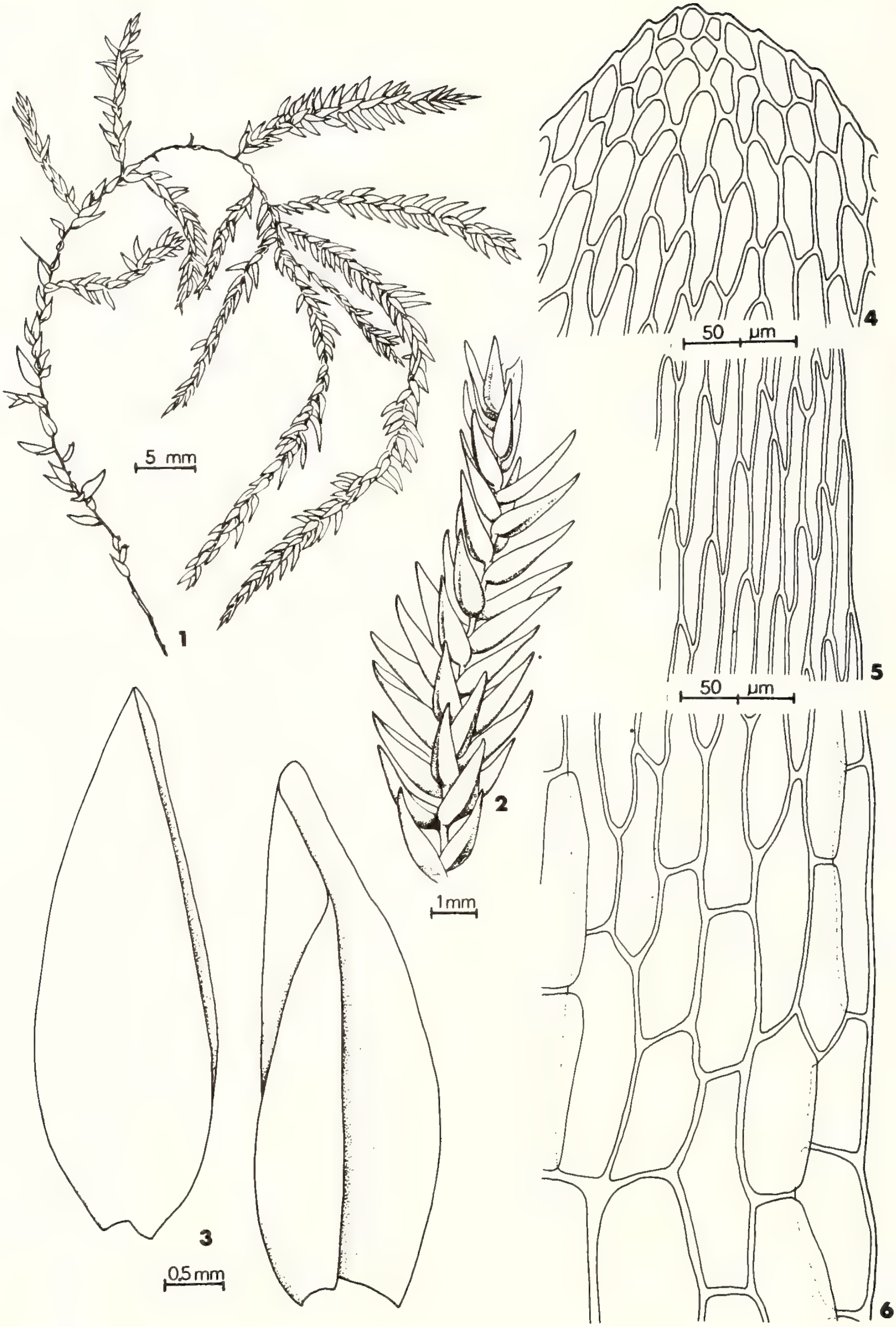
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Plate 236. *Fontinalis antipyretica*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.).

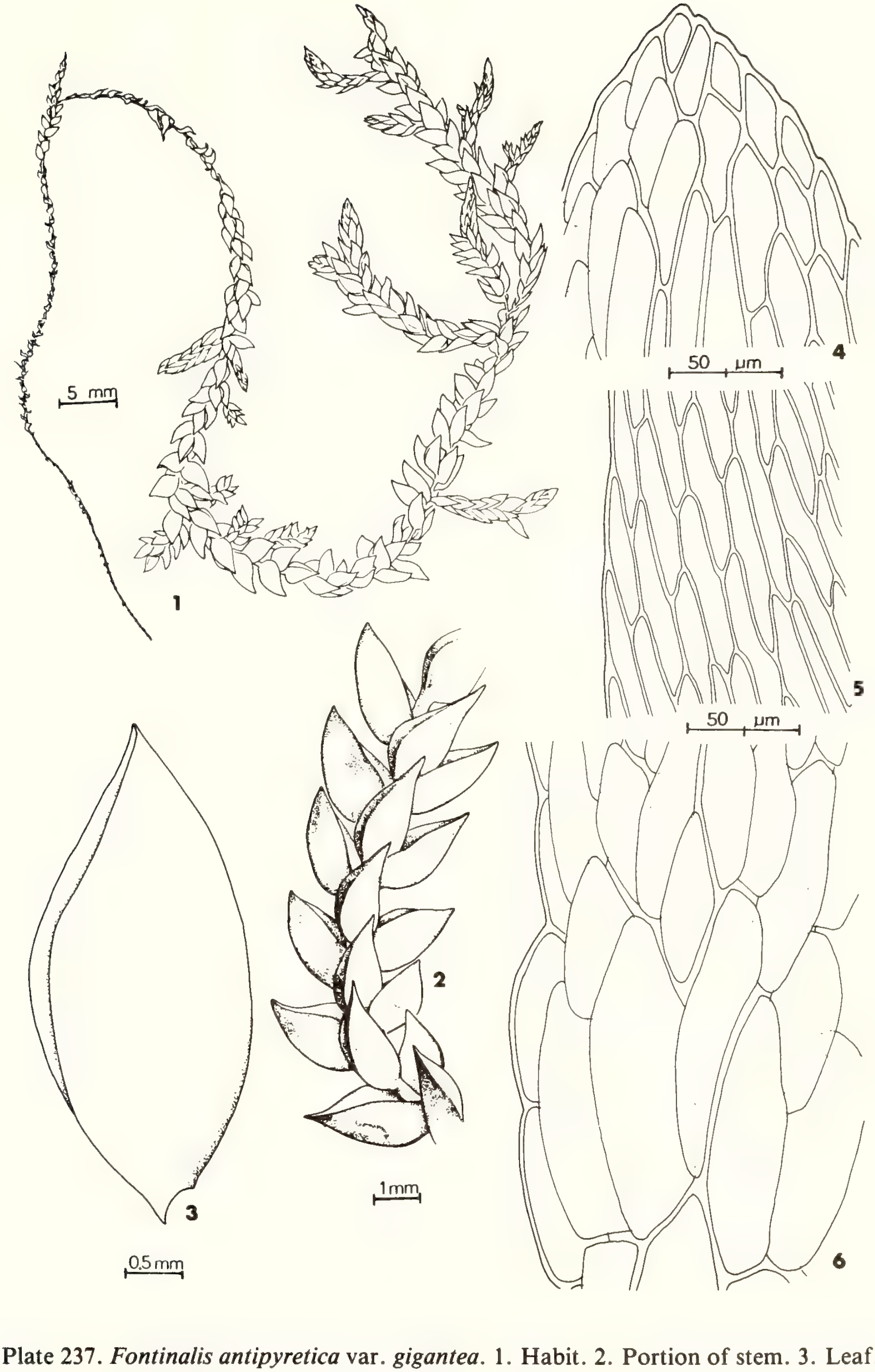
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Plate 237. *Fontinalis antipyretica* var. *gigantea*. 1. Habit. 2. Portion of stem. 3. Leaf. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.).

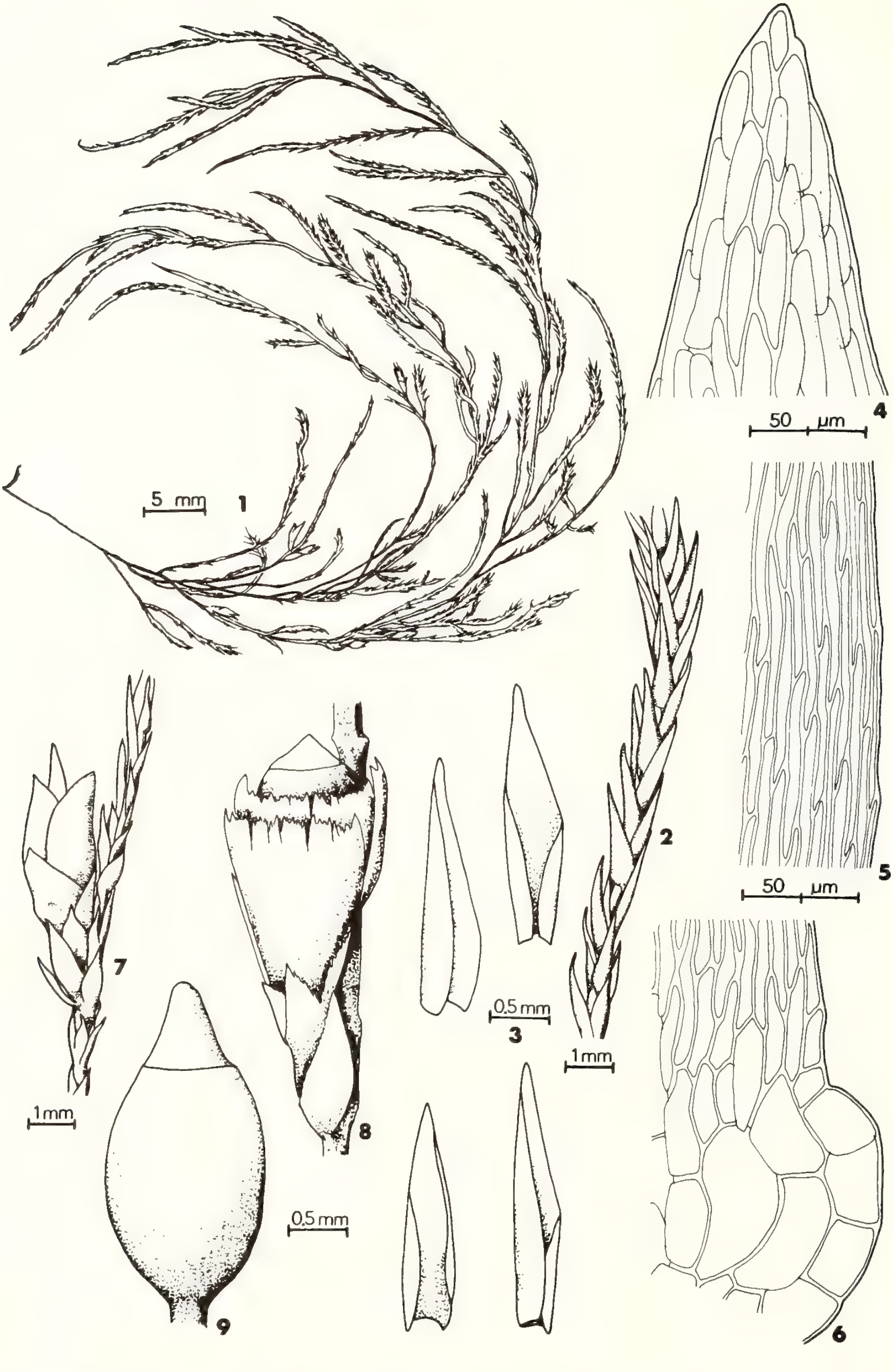
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Plate 238. *Fontinalis dalecarlica*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7–8. Portion of stem with perichaetial leaves and capsules (wet). 9. Capsule (wet).

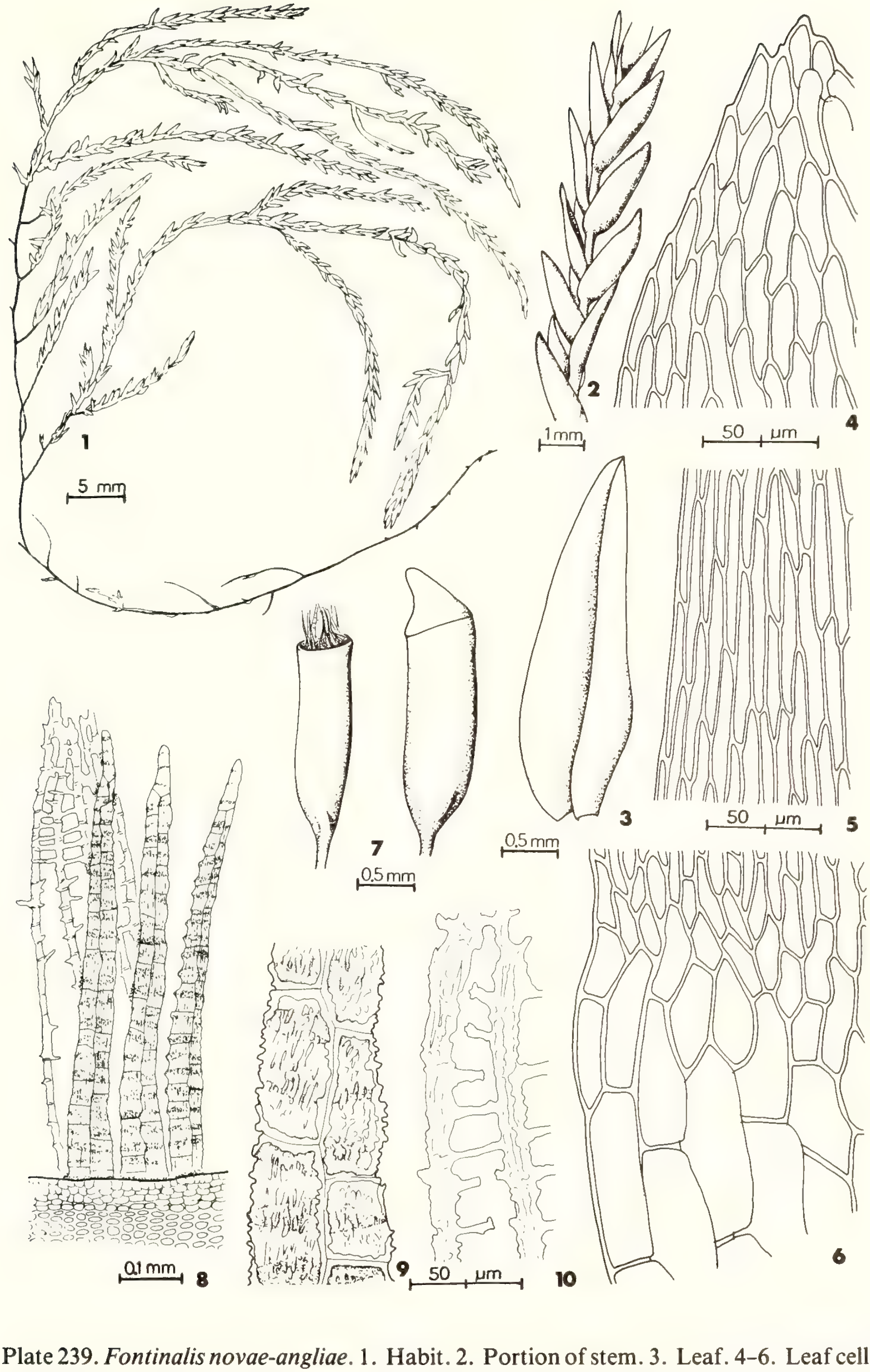
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Plate 239. *Fontinalis novae-angliae*. 1. Habit. 2. Portion of stem. 3. Leaf. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry). 8. Peristome teeth. 9. Median portion of exostome tooth. 10. Median portion of endostome teeth.

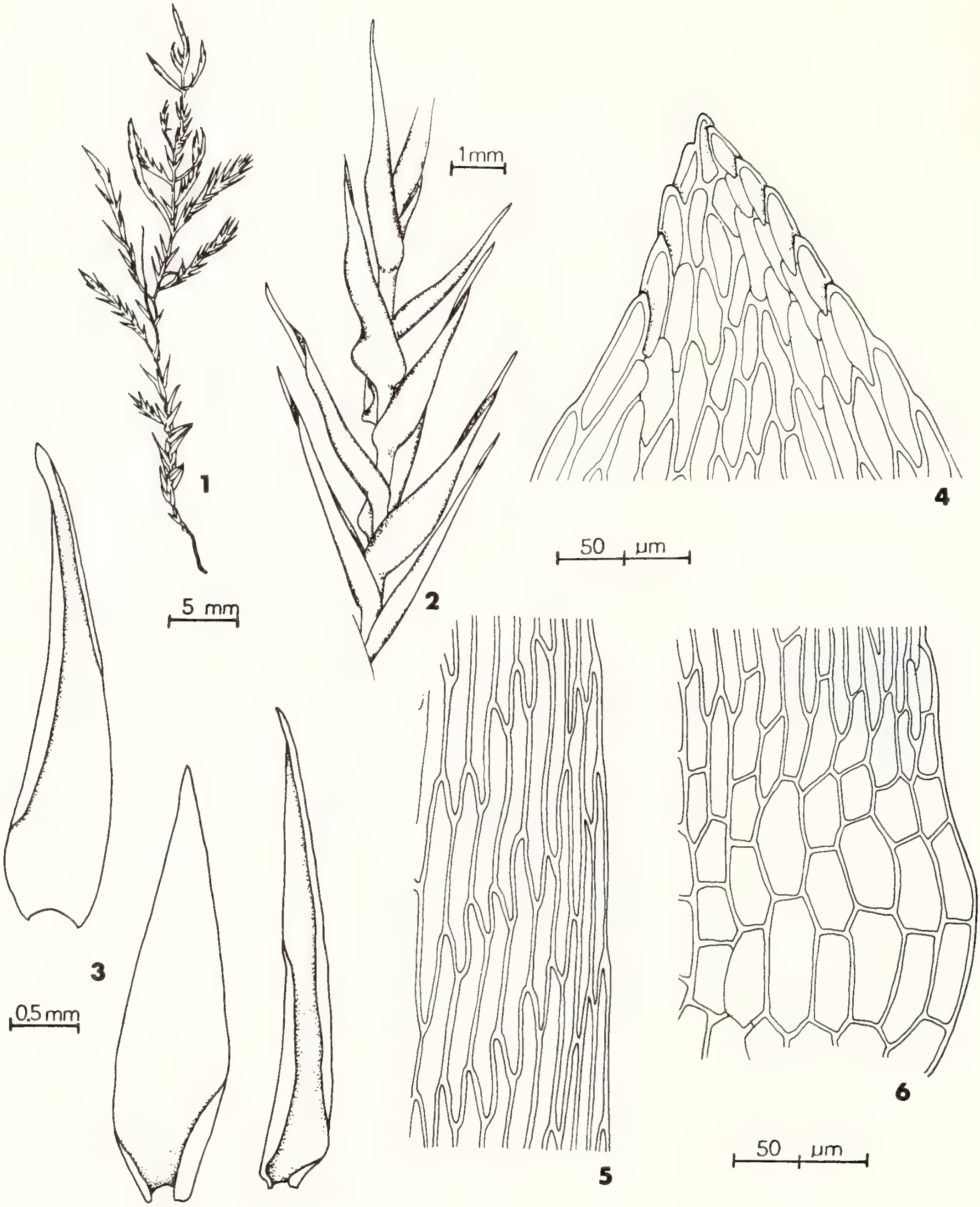
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Plate 240. *Fontinalis sullivantii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.).

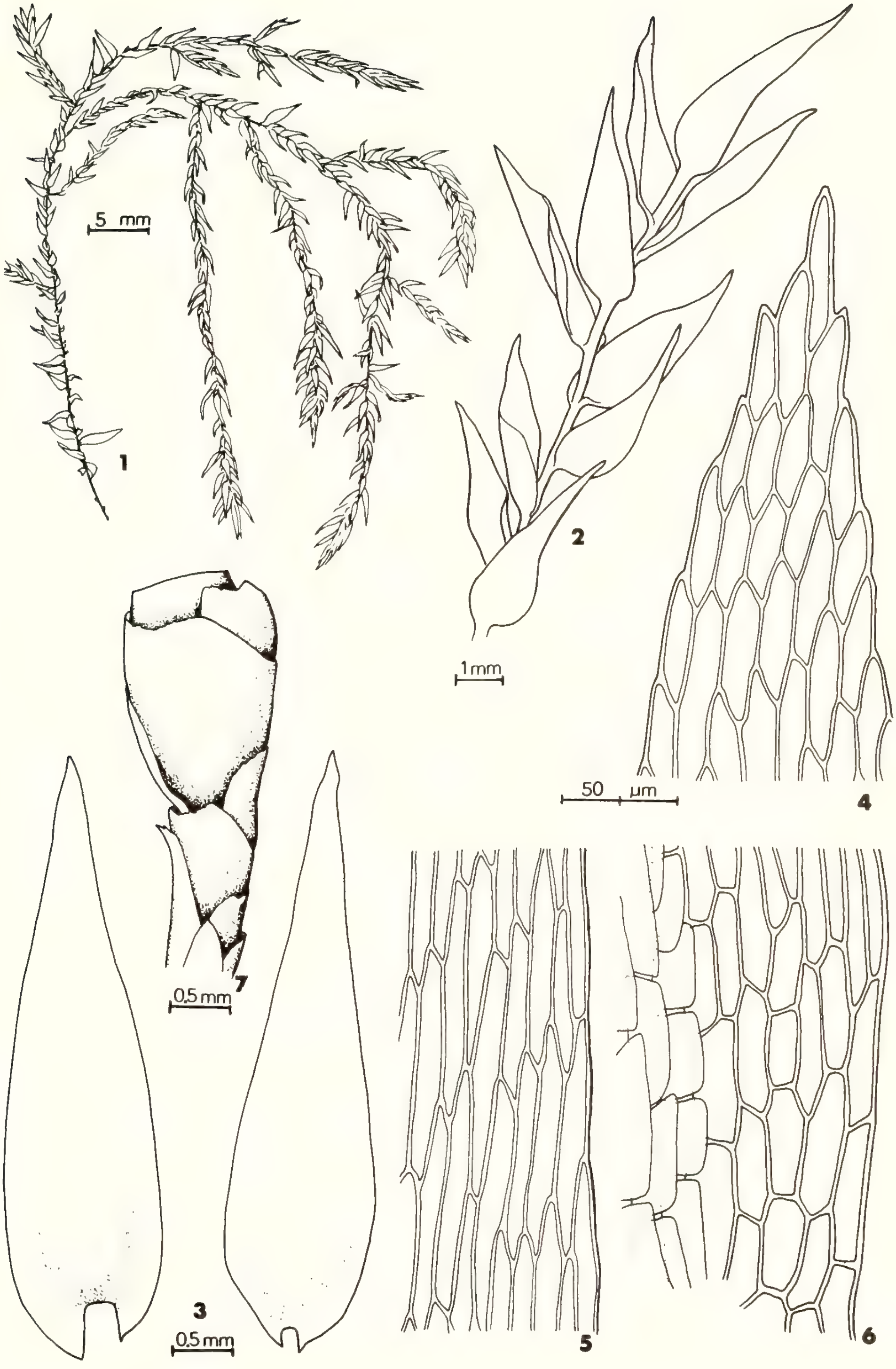
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Plate 241. *Fontinalis hypnoides*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsule with perichaetial leaves (wet).

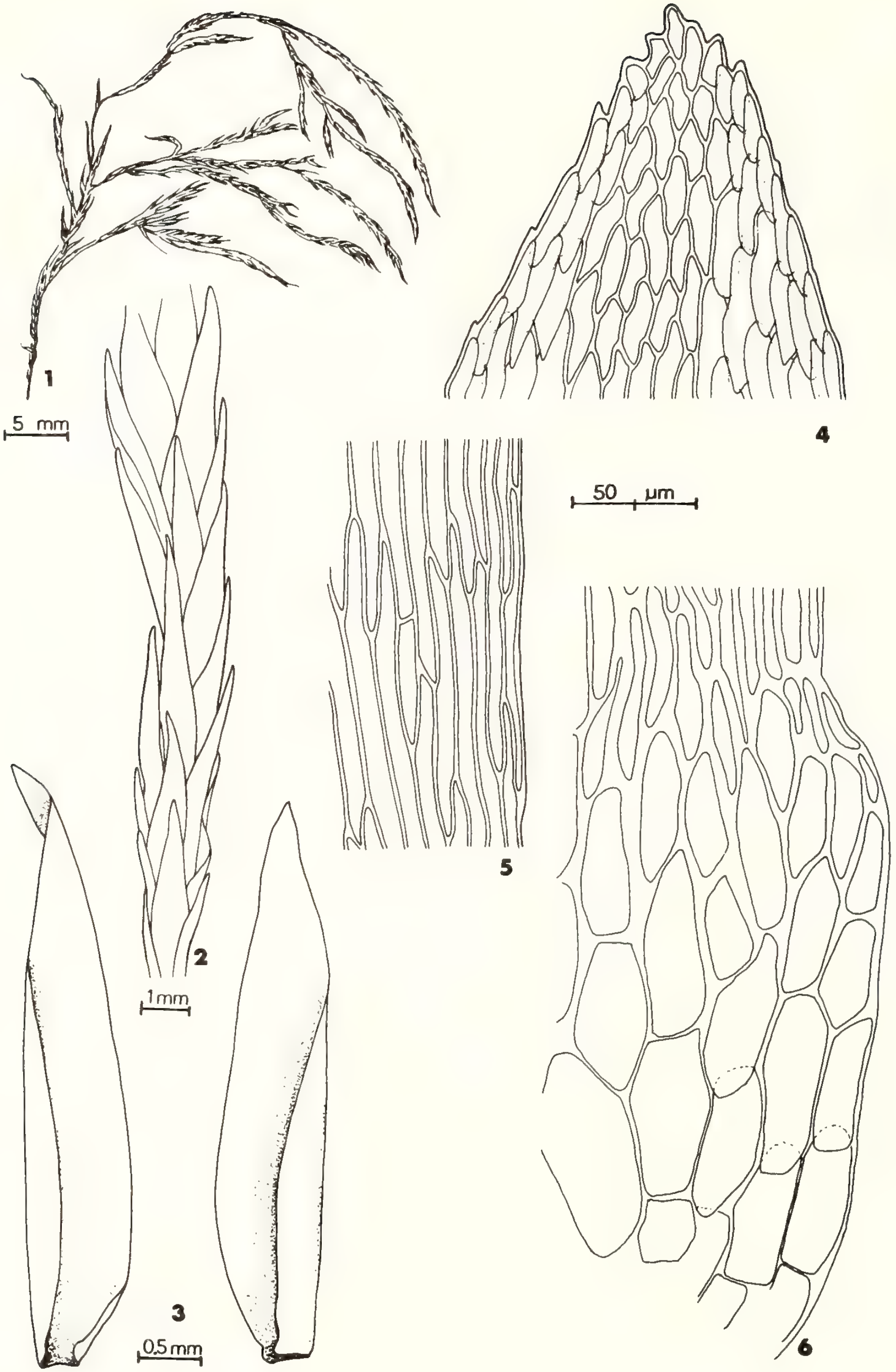
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Plate 242. *Fontinalis flaccida* 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.).

2. **Dichelyma** Myr., K. Svenske Vet. Ak. Handl. 1832: 273. 1833.

Habit: In prostrate, loose mats.

Colour: Green, yellowish green, brownish green, mostly brown below, glossy.

Stems: 3–10 cm long, prostrate, irregularly branched, rhizoids at base.

Leaves: In 3 rows, erect-spreading to spreading, often falcate-secund at ends of stems and branches, somewhat contorted when dry, keeled, unistratose or bistratose on margins, lanceolate to linear-lanceolate, acuminate or acute to obtuse, nondecurrent or shortly decurrent. Perichaetial leaves ecostate, acuminate, convolute, sheathing seta.

Leaf Margins: Plane, serrate to serrulate near apex, entire below, sometimes bistratose.

Costae: Single, subpercurrent to long-excurrent, somewhat prominent on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, lacking pits or with a few pits in basal cells. Median cells linear to linear-rhomboidal, becoming shorter and broader at base and apex, a few quadrate to rectangular cells often present on margins.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, clasping tip of seta until maturity, naked, yellowish.

Capsules: Solitary, immersed to exserted, on a seta arising from stem below apex, yellow to brown, cylindrical to ovoid, straight, erect to inclined, smooth, wrinkled at neck when dry.

Setae: Elongate, straight, smooth, not or little twisted when dry, usually hidden in perichaetial leaves, yellowish.

Annuli: Lacking.

Opercula: Conic to rostrate, beak straight or arcuate.

Peristomes: Double, 16 exostome teeth shorter than endostome, linear or linear-lanceolate, yellowish to yellowish brown, 16 endostome segments, linear, united by transverse bars to form trellis-like cone.

Spores: Yellow to yellowish brown, globose, smooth to minutely papillose, 9–17 μm.

1. Leaves narrow, linear-lanceolate, filiform-acuminate, costae long-excurrent .... 1. *D. capillaceum*
1. Leaves broad, lanceolate, acute to obtuse, costae subpercurrent to percurrent .... 2. *D. pallescens*

1. Dichelyma capillaceum (With.) Myr., K. Svenske Vet. Ak. Handl. 1832: 274. 1833.
Fontinalis capillacea With., Syst. Arr. Brit. Pl. ed. 4, 3: 773. 1801.
PLATE 243

The linear-lanceolate, filiform-acuminate leaves with long-excurrent costae will distinguish this from the next species.

Habitat: In places flooded in the spring, on base of shrubs, trees, on fallen twigs and branches, occasionally rocks, at margins of ponds and lakes.

Maritime Distribution: Frequent New Brunswick (Queen's, York); Nova Scotia (Annapolis, Halifax, Lunenburg, Victoria, Yarmouth).

Range: *Newfoundland to *Manitoba, south to Florida, Mississippi, and Louisiana. Europe, *Asia.

Chromosome Number: Unreported.

2. Dichelyma pallescens B.S.G., Bryol. Eur. 5: 24. 1846 (fasc. 31 Mon. Suppl. 2).
PLATE 244

Plants occurring in a semi-aquatic or aquatic habitat like *D. capillaceum* but the leaves are lanceolate, broader, acute to obtuse and the costae are subpercurrent to percurrent.

Habitat: In places flooded in the spring, on fallen twigs and branches at margins of ponds and lakes.

Maritime Distribution: Rare. New Brunswick (Kent, Queen's, York).

Range: Endemic to eastern North America, from Newfoundland to Ontario, south to New York and Michigan.

Chromosome Number: Unreported.

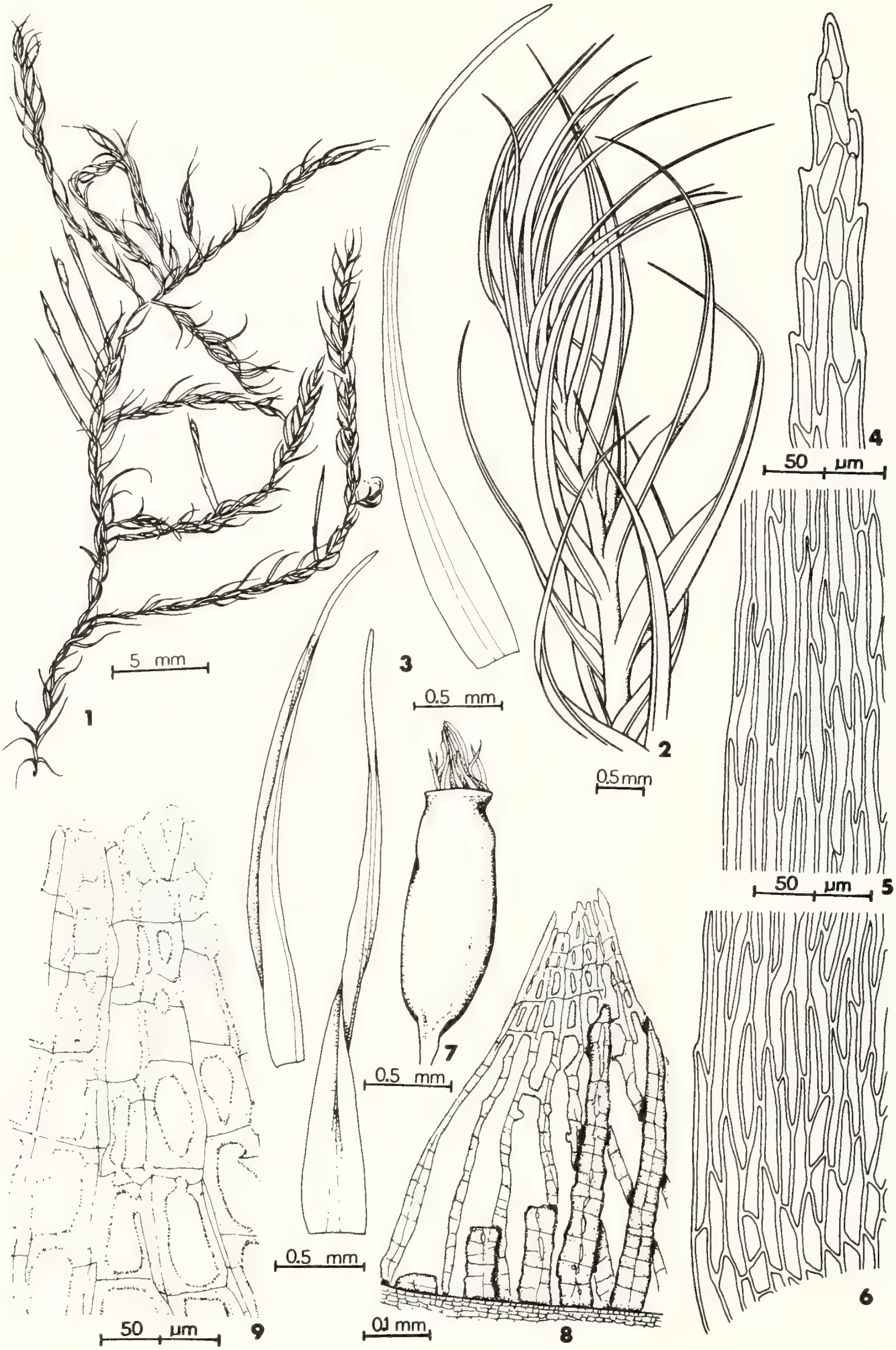
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Plate 243. *Dichelyma capillaceum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsule (dry). 8. Peristome teeth. 9. Enlargement of upper portion of endostome teeth.

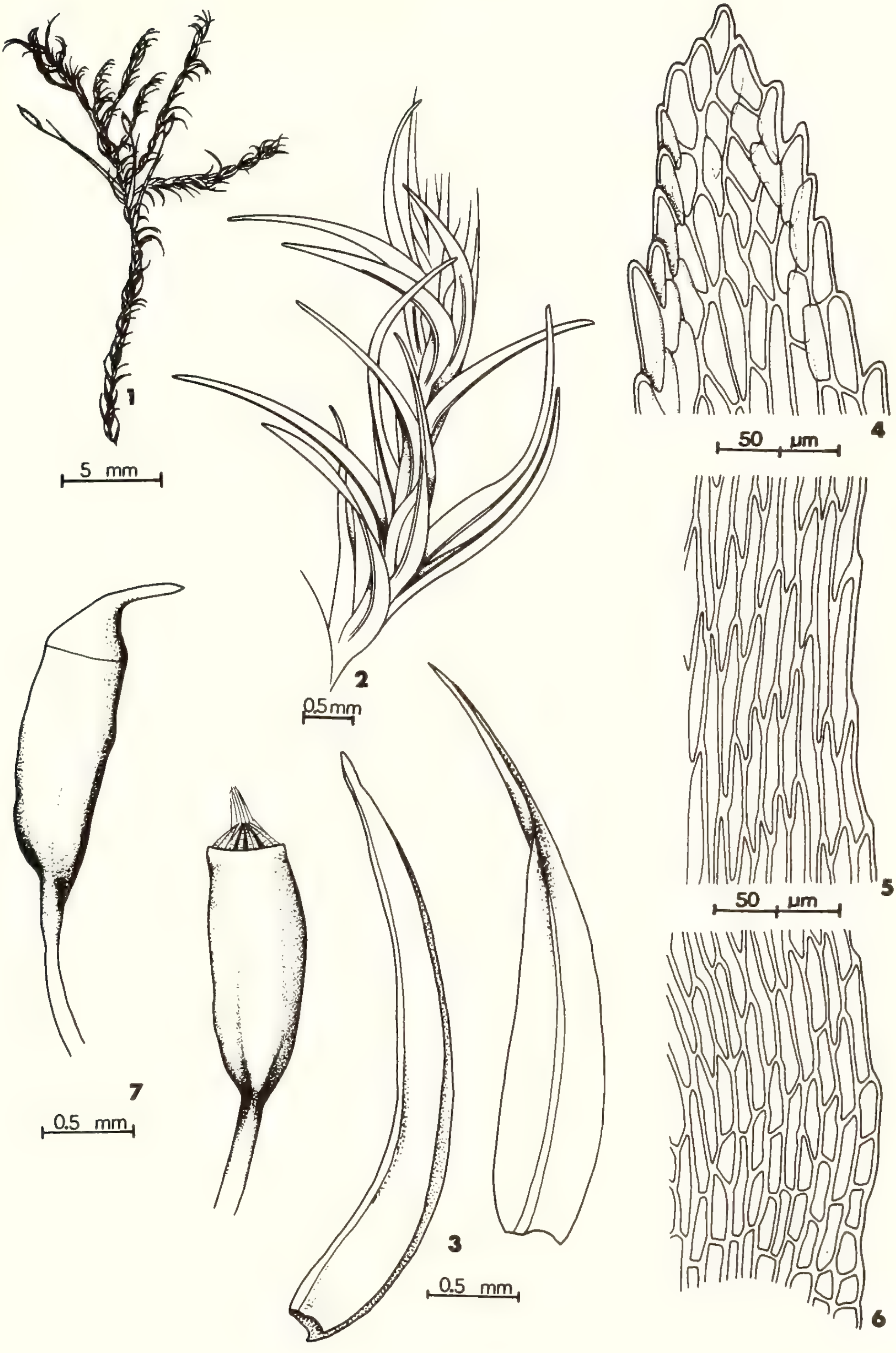
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Plate 244. *Dichelyma pallescens*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry).

Family NECKERACEAE

1. Costae double, short, sometimes lacking; capsules immersed .... 1. *Neckera* (p. 428)
1. Costae single, long, extending to leaf middle or above; capsules exserted 2
    2. Plants complanate; leaves obtuse .... 2. *Homalia* (p. 432)
    2. Plants not complanate; leaves acute .... 3. *Thamnobryum* (p. 434)

1. **Neckera** Hedw., Spec. Musc. 200. 1801.

Habit: In prostrate, loose mats.

Colour: Green to yellowish green or brownish green, glossy.

Stems: Primary stems creeping, often stoloniferous, rhizoids smooth, in clusters just below juncture of leaves on ventral surface of stems, secondary stems 0.8–7.0 cm long, erect to horizontal, simple to pinnately or bipinnately branched, sometimes attenuate at tips. Pseudoparaphyllia foliose, narrowly lanceolate.

Leaves: Secondary stem leaves complanate, asymmetric, little changed when dry, often undulate, flat to slightly concave, unistratose, oblong-lingulate to oblong-ovate, acute to acuminate, shortly decurrent. Perichaetial leaves ecostate, narrowly acuminate, convolute, long-sheathing, longer than capsules.

Leaf Margins: Plane above, inflexed on one side below, entire or serrulate above leaf middle.

Costae: Short and double, extending a short distance above base, rarely lacking.

Leaf Cells: Smooth, walls of median and lower cells of medium thickness, upper cells thick-walled, lower cells pitted, upper cells with few pits. Lower and median cells linear-flexuose, becoming shorter and broader to rhomboidal at apex, alar cells subquadrate or shortly rectangular, basal cells often yellow.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or dioicous. Sporophytes unknown on North American plants of *N. complanata*.

Calyptrae: Cucullate, naked, light yellow, short, only covering operculum.

Capsules: Solitary, immersed, on short setae scattered along secondary stems, brown, oblong-ovoid, straight, erect, smooth, slightly striate to furrowed when dry.

Setae: Short, straight, smooth, not twisted when dry, yellow, completely hidden in perichaetial leaves.

Annuli: Lacking.

Opercula: Conic, obliquely apiculate to short-rostrate.

Peristomes: Double, 16 exostome teeth, narrowly lanceolate, often cohering at tips, transversely striolate below, smooth above, whitish, endostome segments linear, short, irregular, usually adhering to exostome teeth, cilia lacking.

Spores: Yellow to yellowish brown, globose, densely and finely papillose, 15–29 μm.

1. Leaves undulate, acute to acuminate; plants autoicous, capsules often present; on trees or sometimes rock .... 1. *N. pennata*
1. Leaves smooth, obtuse, apiculate; plants dioicous, capsules unknown; on rock .... 2. *N. complanata*

1. Neckera pennata Hedw., Spec. Musc. 200. 1801.

PLATE 245

Plants glossy, green to yellowish or brownish green, in flattened mats, leaves 2–3 mm long, complanate, strongly undulate, oblong-lanceolate to oblong-ovate, acute to acuminate, margins serrulate above, costae short and double or lacking; autoicous, sporophytes often present, setae about 1 mm long, capsules immersed, 1–2 mm long, oblong-ovoid, erect.

Habitat: On tree trunks and occasionally on rock outcrops.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Restigouche, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Greenland to *Alaska, south to North Carolina, Michigan, Wisconsin, Minnesota, *New Mexico, and Arizona. *South America, Europe, Asia, *Africa, *Australia, New Zealand.

Chromosome Number: n = 10.

2. Neckera complanata (Hedw.) Hüb., Musc. Germ. 576. 1833.

Leskea complanata Hedw., Spec. Musc. 231. 1801.

PLATE 246

Differs from *N. pennata* by the smooth leaves with obtuse, apiculate apices and the dioicous plants that always occur without sporophytes in the Maritimes.

Habitat: On boulders, cliff ledges and tree trunks.

Maritime Distribution: Common. New Brunswick (Queen's, Saint John); Nova Scotia (Antigonish, Cape Breton, Digby, Halifax, Hants, Inverness, Kings, Pictou, Shelburne, Victoria, Yarmouth).

Range: Known from *Labrador, Newfoundland, Nova Scotia, New Brunswick, Tennessee, North Carolina, Georgia, and Arkansas. Iceland, Europe, Asia, *Africa.

Chromosome Number: n = 10, 11, 12.

Remarks: Both sporophytes and male plants are unknown from the Maritimes, as well as the rest of North America. The sporophytes are reported to have an ovate-ellipsoid capsule, exserted on a long (8–10 mm), flexuose seta.

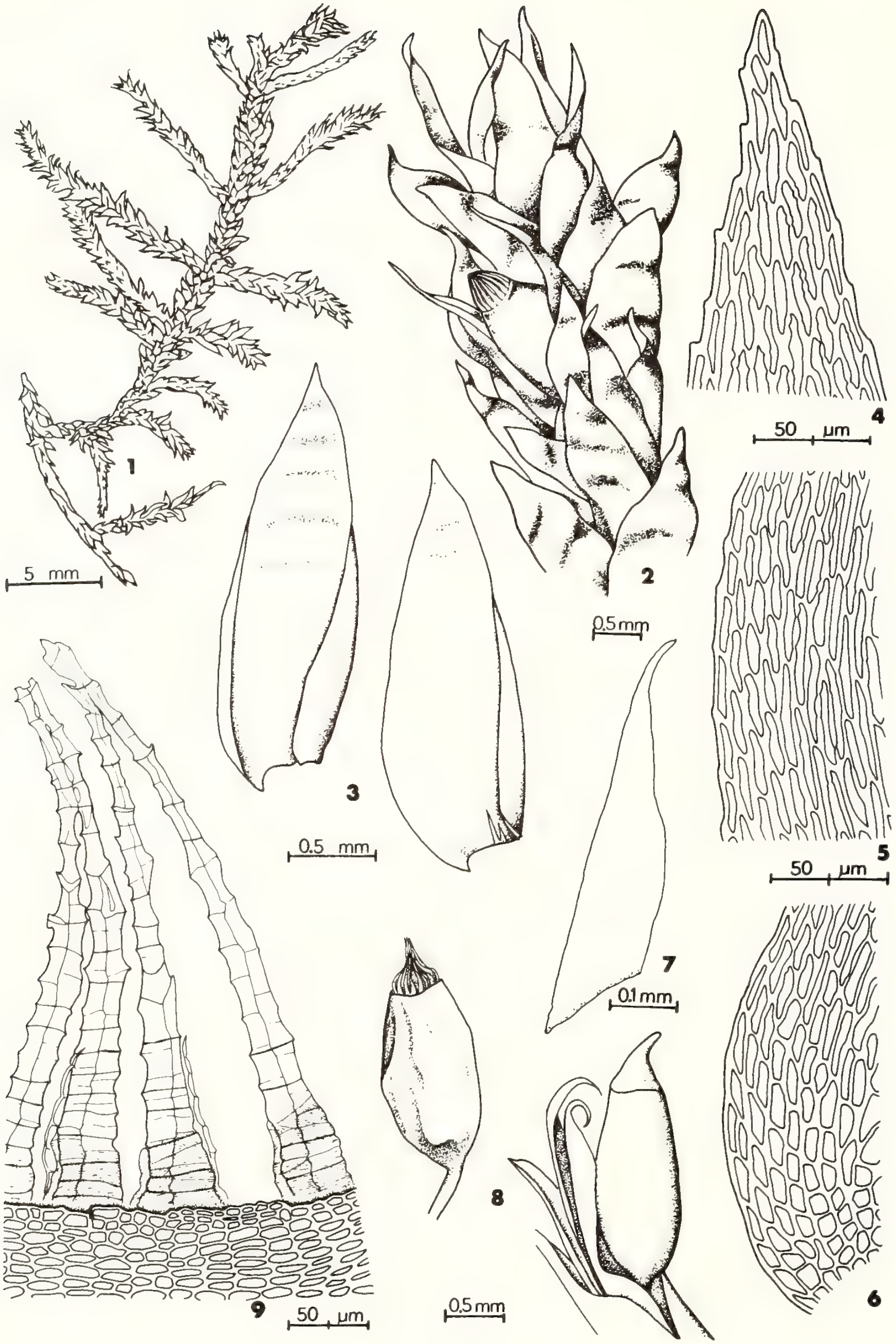
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Plate 245. *Neckera pennata*. 1. Habit. 2. Portion of branch with capsule. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Pseudoparaphyllium. 8. Capsules (dry). 9. Peristome teeth.

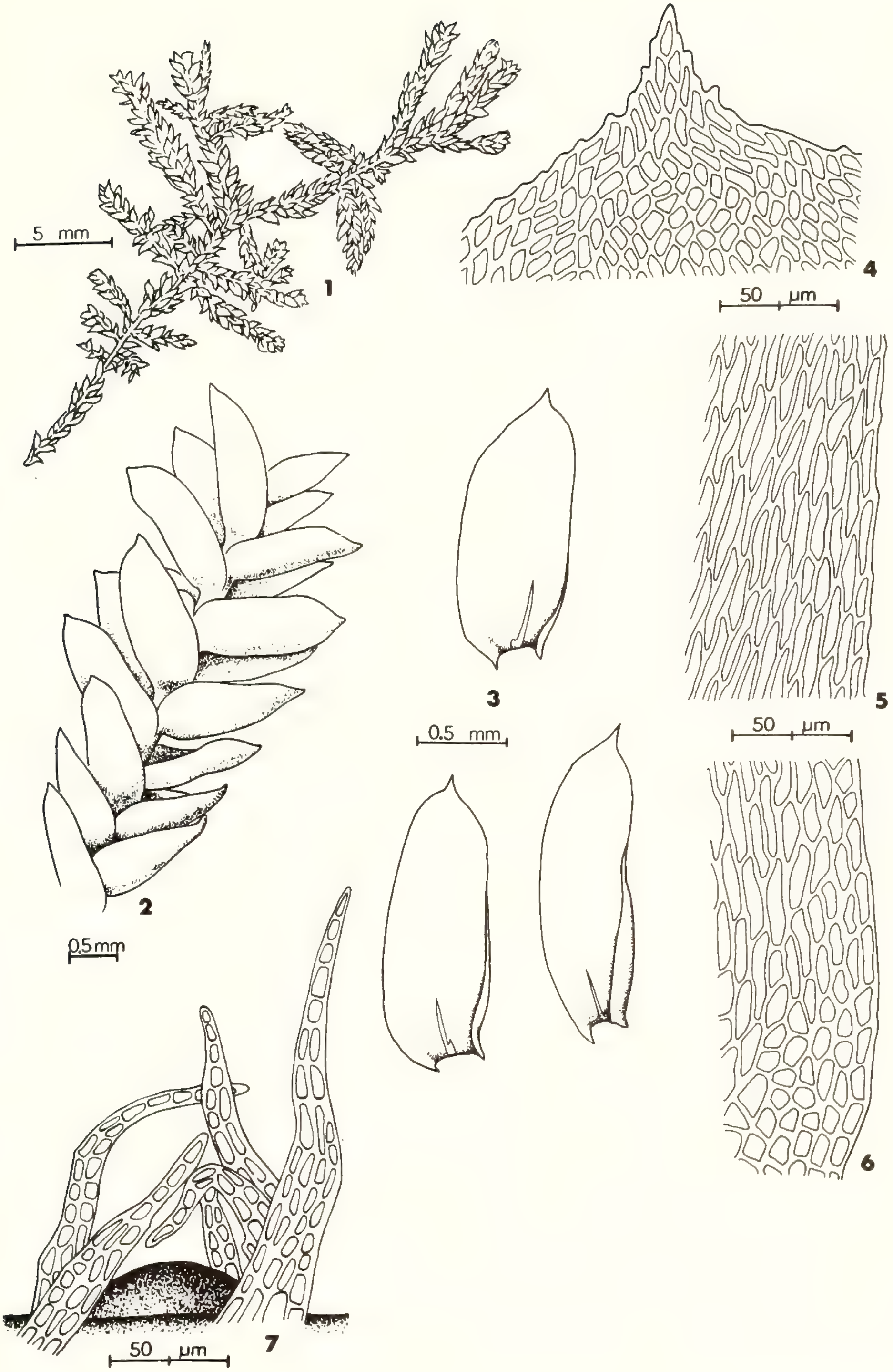
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Plate 246. *Neckera complanata*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Pseudoparaphyllia.

2. **Homalia** (Brid.) B.S.G., Bryol. Eur. 5: 53. 1850 (fasc. 44–45 Mon. 1).
Leskea subg. *Omalia* Brid., Bryol. Univ. 2: 325. 1827.

Habit: In prostrate, loose, flat mats.

Colour: Green or yellow-green, glossy.

Stems: Primary stems slender, creeping, stoloniferous, rhizoids smooth or papillose, in clusters just below juncture of leaves and between leaves, secondary stems 1–5 cm long, horizontal, irregularly branched. Pseudoparaphyllia lacking.

Leaves: Secondary stem leaves wide-spreading, strongly complanate, asymmetric, smooth, slightly striolate when dry, flat, unistratose, oblong-lingulate to oblong-cultriform, obtuse, sometimes apiculate, non-decurrent. Perichaetial leaves ecostate, acuminate, short-sheathing.

Leaf Margins: Plane or inflexed on one side at base, irregularly serrulate to serrate above, entire to weakly serrulate below.

Costae: Single, slender, extending $^1/_2$ to $^2/_3$ the leaf length, less often short and double.

Leaf Cells: Smooth, the walls of medium thickness, lower cells weakly to strongly pitted, upper cells not or slightly pitted. Lower and median cells linear-fusiform, apical and median-marginal cells broadly rhomboidal, alar cells slightly differentiated, transversely rectangular to irregularly quadrate.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked.

Capsules: Solitary, on a seta arising from middle of secondary stems, brown, cylindric to narrowly oblong-cylindric, slightly arcuate, erect to inclined, smooth.

Setae: Elongate, straight to somewhat flexuose, smooth, not or little twisted when dry, red to reddish brown.

Annuli: 1–2 rows of large cells, deciduous, fragmenting.

Opercula: High-conic to long-rostrate, slightly curved.

Peristomes: Double, 16 exostome teeth, linear-lanceolate, cross-striolate below, papillose above, with well-developed trabeculae, yellow with pale borders, 16 endostome segments, linear-lanceolate, as long as the exostome teeth, smooth below, papillose at tips, pale, cilia lacking or rudimentary.

Spores: Yellow, globose, papillose, 12–18 μm.

1. **Homalia trichomanoides** (Hedw.) B.S.G., Bryol. Eur. 5: 55. 446. 1850 (fasc. 44–45 Mon. 3.1).
Leskea trichomanoides Hedw., Spec. Musc. 231. 1801.
[Synonyms: *H. jamesii* Schimp.; *H. macounii* C. Müll. & Kindb. *ex* Mac. & Kindb.]
PLATE 247

Plants glossy, yellowish green, in flattened mats, leaves 1–2 mm long, complanate, smooth, slightly striolate when dry, appearing distichous, oblong-lingulate to oblong-cultriform, obtuse, sometimes apiculate, margins irregularly serrulate to serrate above, costae single, ending $^1/_2$–$^2/_3$ leaf length; autoicous, seldom producing sporophytes, setae 8–10 mm long, capsules 1.5–2.0 mm long, oblong-cylindric, erect to inclined.

Habitat: On rock ledges, limy bluffs, shaded faces of cliffs and occasionally at bases of trees.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Madawaska, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Guysborough, Hants, Inverness, Kings, Lunenburg, Pictou, Victoria); Prince Edward Island (Kings, Queens).

Range: Labrador to Ontario, south to North Carolina, Mississippi, and *Arkansas; also in British Columbia, Washington, and *Arizona. Mexico, Europe, Asia, *Africa.

Chromosome Number: n = 11, 12.

Remarks: *Homalia*, when sterile, may resemble some species of leafy liverworts to the unacquainted, but the moss is distinguished immediately by the leaves with single costae.

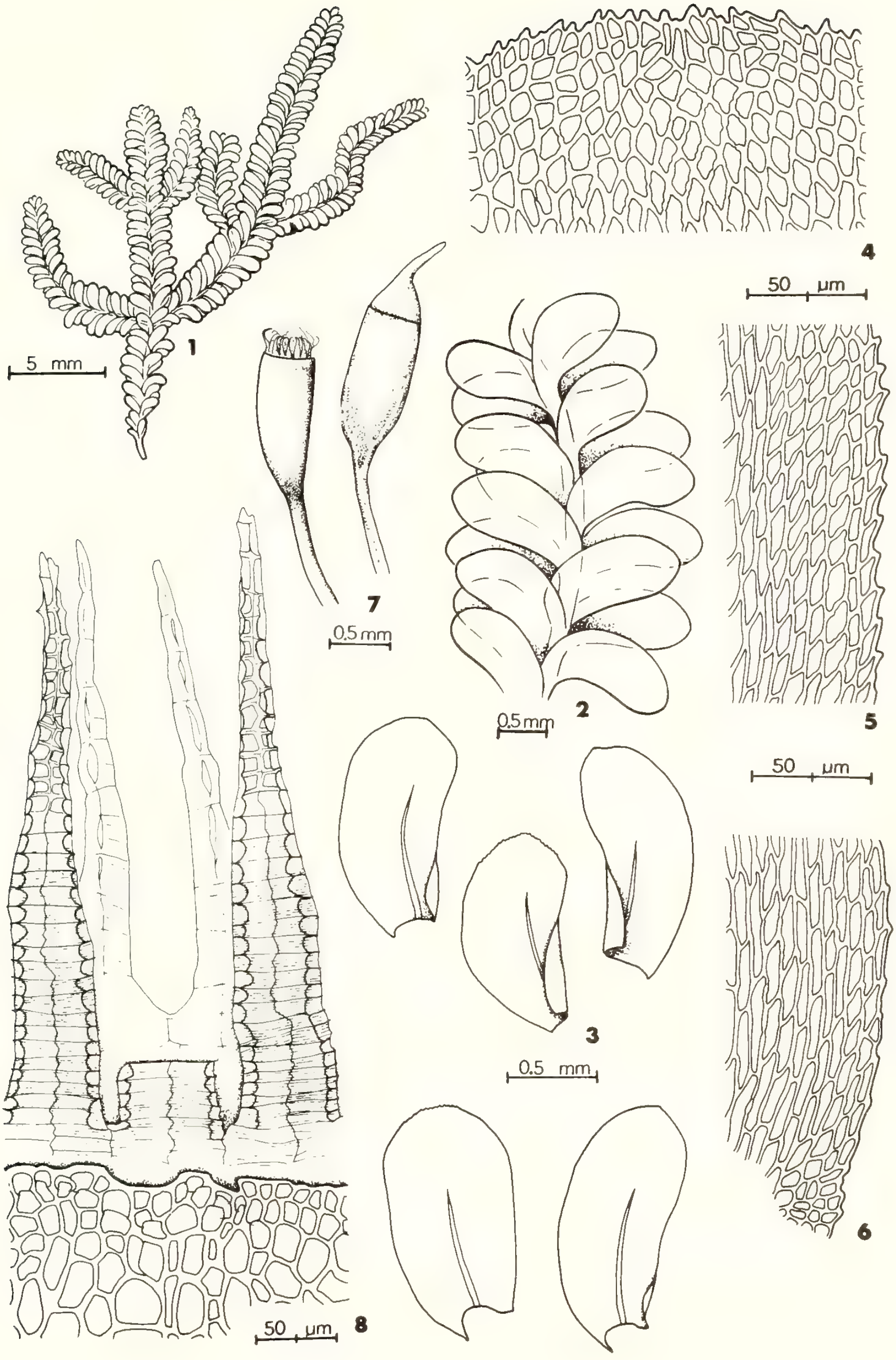
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Plate 247. *Homalia trichomanoides*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry). 8. Peristome teeth.

3. **Thamnobryum** Nieuwl., Amer. Midland Natural. 5: 50. 1917.

Habit: In erect to inclined, subdendroid to dendroid, loose mats.

Colour: Light to dark green, dull.

Stems: Primary stems creeping, stoloniferous, rhizoids smooth, in clusters just below juncture of leaves, secondary stems 2.0–5.5 cm long, erect to inclined, dendroidly branched, branches often decurved, rhizoids at base. Pseudoparaphyllia foliose, lanceolate.

Leaves: Secondary stem leaves erect-patent, slightly incurved when dry, concave, symmetric, smooth, unistratose, ovate to oblong-lanceolate, acute, nondecurrent. Perichaetial leaves costate, acuminate, short-sheathing.

Leaf Margins: Plane, coarsely and irregularly toothed at apex, serrate at middle, entire below.

Costae: Single, ending below apex, prominent, with a few teeth above on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, becoming thick-walled at apex, lower cells weakly to strongly pitted, upper cells not or slightly pitted. Median cells short-rhomboidal to elliptic, becoming short- to elongate-rectangular towards base, lower marginal cells subquadrate to quadrate.

Asexual Reproductive Bodies: Lacking.

Sex: Synoicous or autoicous. Maritime plants lacking sporophytes.

Calyptrae: Cucullate, naked.

Capsules: Solitary, on setae scattered along the secondary stem branches, brown, oblong to oblong-ovoid, slightly arcuate, erect to inclined, smooth, weakly striate when dry.

Setae: Elongate, flexuose above, rarely straight, not twisted when dry, reddish brown.

Annuli: 1–2 rows of large cells, deciduous.

Opercula: Conic to obliquely rostrate.

Peristomes: Double, 16 exostome teeth, linear-lanceolate, transversely striolate below, weakly papillose above, yellow, 16 endostome segments, linear-lanceolate, as long as the exostome teeth, smooth below, minutely papillose above, hyaline, 2–3 cilia, appendiculate.

Spores: Yellow, globose, papillose, 12–18 μm.

1. **Thamnobryum alleghaniense** (C. Müll.) Nieuwl., Amer. Midland Natural. 5: 51. 1917. *Hypnum alleghaniense* C. Müll., Syn. 2: 502. 1851.
[Synonym: *Porotrichum alleghaniense* (C. Müll.) Grout]
PLATE 248

Plants dull, light to dark green, erect, subdendroid to dendroid, branches often decurved, leaves 1.5–3.0 mm long, concave, smooth, ovate to oblong-lanceolate, acute, margins irregularly toothed above, costae single, ending just below apex, toothed near apex on dorsal surface; synoicous or autoicous. Maritime plants not seen with sporophytes, reported with setae 10–15 mm long, capsules 1.5–2.0 mm long, oblong to oblong-ovoid, erect to inclined.

Habitat: On wet rock ledges beside creeks and on humus over rock.

Maritime Distribution: Frequent. New Brunswick (Albert); Nova Scotia (Annapolis, Colchester, Guysborough, Inverness, Kings).

Range: Nova Scotia to Ontario, south to Georgia, Alabama, and Arkansas. *Asia.

Chromosome Number: Unreported.

Remarks: Capsules and peristome drawn from Ontario plants.

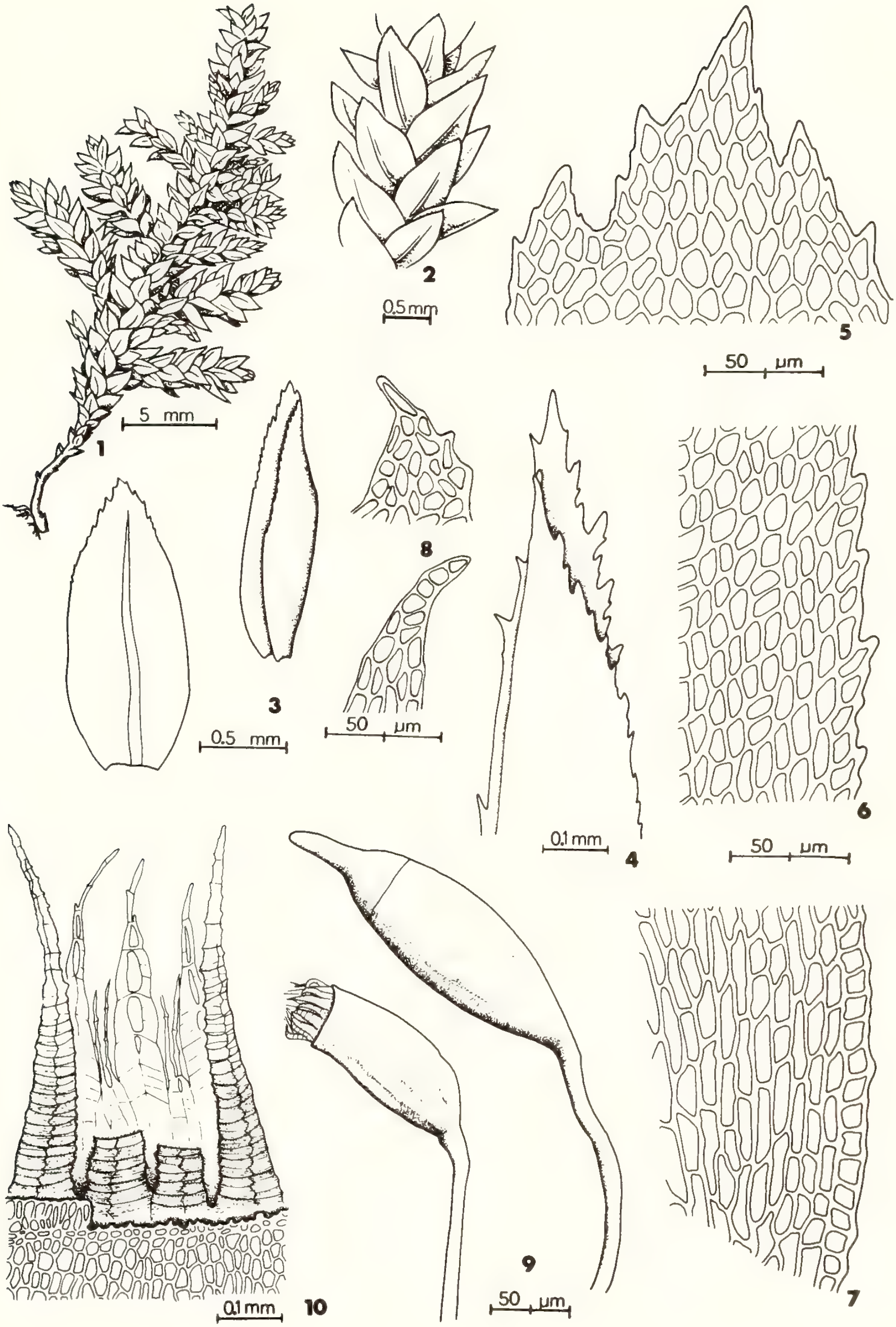
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Plate 248. *Thamnobryum alleghaniense* 1. Habit. 2. Portion of branch. 3. Leaves. 4. Side view of leaf apex. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Capsules (dry). 10. Peristome teeth.

Anacamptodon Brid., Mant. Musc. 136. 1819.

Habit: In prostrate, loose mats.

Colour: Dark green to yellow-green, dull to somewhat glossy.

Stems: 0.3–1.5 cm long, creeping, irregularly branched, with scattered rhizoids, branches somewhat ascending.

Leaves: Spreading, often secund at apex, erect and slightly homomallus when dry, slightly concave below, flat above, unistratose, ovate-lanceolate, acuminate, nondecurrent. Perichaetial leaves weakly costate, lance-acuminate, slightly sheathing.

Leaf Margins: Plane, entire.

Costae: Single, ending at or above leaf middle, slightly prominent below on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, not pitted. Median cells oblong-rhombic, becoming oblong-rhomboidal above and rectangular at base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish.

Capsules: Solitary, on setae scattered along stems, brown to yellow-brown, oblong-cylindric, straight, erect, smooth, strongly constricted at mouth and neck when dry.

Setae: Straight or slightly flexuose above, not twisted when dry, yellow-brown to red.

Annuli: Slightly differentiated in 1 row of small cells, fragmenting.

Opercula: Obliquely apiculate to short-rostrate.

Peristomes: Double, 16 exostome teeth, lanceolate, densely and finely papillose, inserted below the mouth, united in pairs and strongly recurved when dry, yellow-brown, endostome segments filiform, smooth, red-brown, alternating with the longer exostome teeth, cilia lacking.

Spores: Yellow-green, globose, roughly papillose, 9–15 μm.

1. **Anacamptodon splachnoides** (Froehl. *ex* Brid.) Brid., Mant. Musc. 136. 1819.
Orthotrichum splachnoides Froehl. *ex* Brid., Spec. Musc. 2: 4. 1812.
PLATE 249

Plants prostrate, usually dark green, stems short, 0.3–1.5 cm long, leaves ovate-lanceolate, acuminate, 0.8–1.5 mm long, margins plane, entire, cells smooth, median cells oblong-rhombic, costae single, extending half-way up leaves; autoicous, capsules oblong-cylindric, erect, smooth, strongly constricted under mouth when dry, peristome teeth strongly recurved when dry.

Habitat: In seepy knotholes and fissures of deciduous tree trunks.

Maritime Distribution: Rare. New Brunswick (Kent); Nova Scotia (Colchester, Halifax, Victoria).

Range: Widespread in eastern North America, from Nova Scotia to Ontario, south to Florida, Louisiana, and Texas. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: Commonly called the "Knothole Moss" because of its occurrence in seepy knotholes. In the Maritimes it apparently always occurs on deciduous trees and usually high on the trunks.

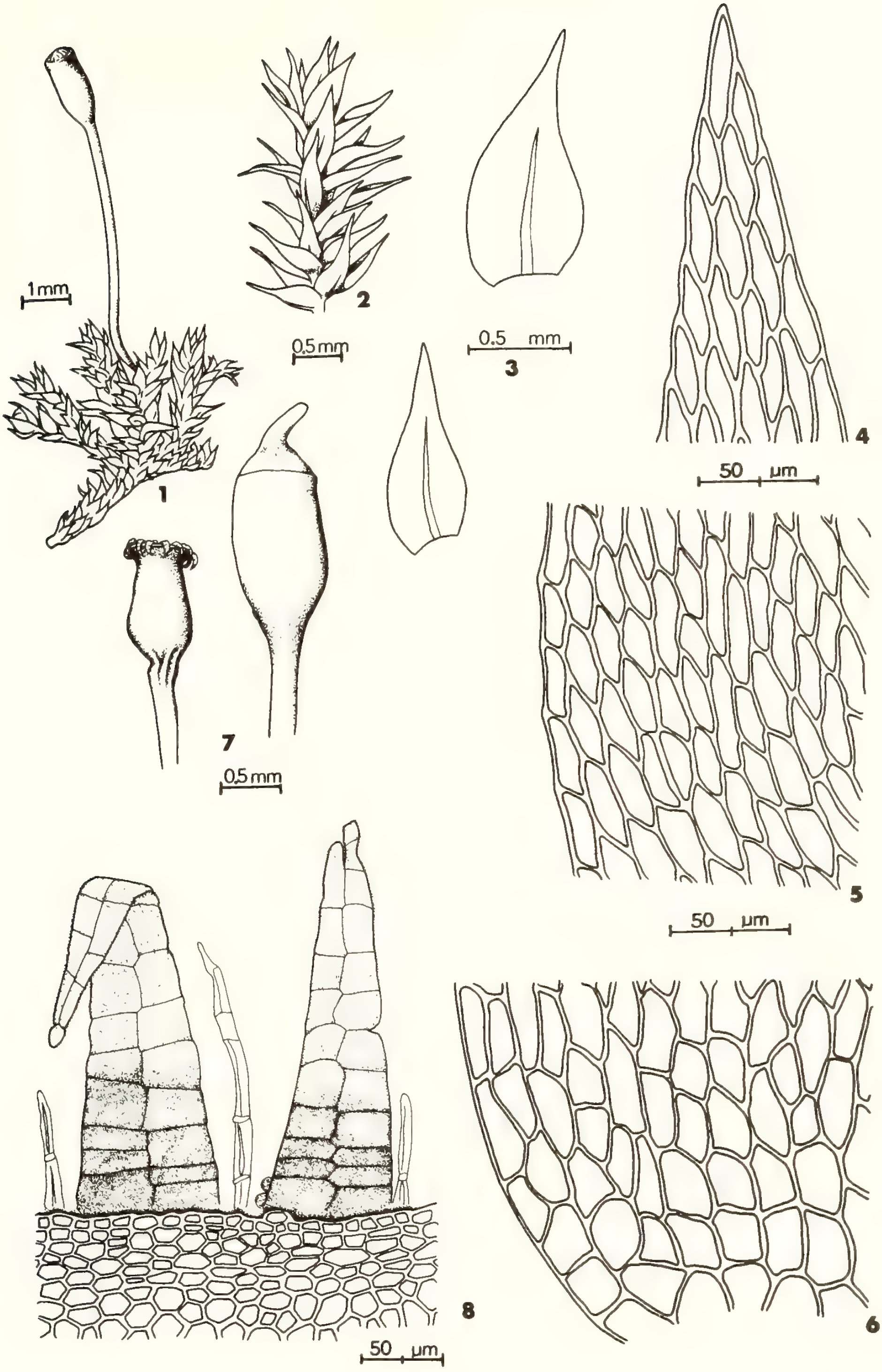
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Plate 249. *Anacamptodon splachnoides*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules, operculate (wet), inoperculate (dry). 8. Peristome teeth.

Family LESKEACEAE

1. Leaf cells multipapillose 2

2. Leaf apices deciduous, only rarely present .... 6. *Haplohymenium* (p. 449)

2. Leaf apices nearly always present .... 7. *Anomodon* (p. 451)

1. Leaf cells smooth or unipapillose 3

3. Margins of stem leaves ciliate .... 5. *Thelia* (p. 447)

3. Margins of stem leaves not ciliate 4

4. Leaf cells prorate on dorsal surface; costae weak, short and double or sometimes single; pseudoparaphyllia present, filamentous; axillary gemmae often present, 2–3 celled, ovoid or cylindric .... 4. *Pterigynandrum* (p. 445)

4. Leaf cells smooth or unipapillose over cell lumen; costae strong, single; paraphyllia often present; gemmae lacking 5

5. Costae excurrent; leaf cells smooth; brood branchlets often present and clustered near tips of branches .... 2. *Leskeella* (p. 441)

5. Costae subpercurrent; leaf cells smooth or unipapillose; brood branchlets lacking 6

6. Leaves acute to somewhat acuminate; autoicous, sporophytes often present .... 1. *Leskea* (p. 438)

6. Leaves acuminate; dioicous, sporophytes unknown on Maritime plants .... 3. *Lescuraea* (p. 443)

1. **Leskea** Hedw., Spec. Musc. 211. 1801.

Habit: In prostrate, loose mats.

Colour: Green to dark green or yellow-brown, dull.

Stems: 1.5–3.5 cm long, creeping, subpinnately branched, rhizoids sparse, smooth, in clusters on ventral surface just below juncture of leaves, branches sometimes ascending. Paraphyllia few on stems and branches, linear-lanceolate.

Leaves: Erect-spreading, erect to loosely appressed, with incurved tips when dry, usually slightly asymmetric, concave, smooth to biplicate at base, oblong-ovate with acuminate to acute, often oblique apices, somewhat subsecund, slightly decurrent. Perichaetial leaves weakly costate, oblong-lanceolate, slightly sheathing.

Leaf Margins: Plane or revolute to middle, entire or subserrulate.

Costae: Single, ending below apex, slightly prominent on dorsal surface, rhizoids sometimes on dorsal surface near base of leaf.

Leaf cells: Papillose on dorsal or on both surfaces, usually with 1 small papilla in the center of the lumen of the median cells, other cells smooth or papillae indistinct, the walls thick to medium thickness, not pitted. Apical and median cells round to quadrate-hexagonal, becoming broader and longer at base, alar cells quadrate to transversely subrectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish.

Capsules: Solitary, on setae scattered along stems, yellow- to red-brown, subcylindric, erect, arcuate, smooth, weakly striolate and contracted below mouth when dry.

Setae: Straight to flexuose, twisted when dry, red-brown.

Annuli: 1–2 rows of cells, fragmenting.

Opercula: Conic.

Peristomes: Double, 16 exostome teeth, linear-lanceolate, not bordered, striolate near base, papillose above, inserted near mouth, whitish to yellow, endostome segments linear, papillose, yellowish, cilia rudimentary or lacking.

Spores: Yellow, globose, roughly papillose, 12–15 μm.

1. **Leskea polycarpa** Hedw., Spec. Musc. 225. 1801.

PLATE 250

Plants in prostrate mats, stems subpinnately branched, paraphyllia present, few, linear-lanceolate, leaves 0.5–1.5 mm long, erect-spreading, appressed or nearly so when dry, ovate to ovate-lanceolate, acute to acuminate, apex usually oblique, margins often recurved below, entire or finely serrulate at apices, costae single, ending below apex, median cells usually with a single, central papilla, other cells smooth or papillae indistinct; autoicous, setae 1.0–1.5 cm long, capsules 2–3 mm long, cylindric, erect, straight or slightly arcuate.

Habitat: On logs and bases of trees.

Maritime Distribution: Common. New Brunswick (Carleton, Kent, Restigouche, Saint John, York); Nova Scotia (Annapolis, Guysborough, Halifax, Kings, Shelburne, Yarmouth).

Range: *Newfoundland to Manitoba, south to Virginia, Tennessee, Mississippi, Louisiana, and Nebraska; also in British Columbia. Europe, Asia, *Africa.

Chromosome Number: n = 10, 11, 13.

Remarks: The long-cylindric, erect, straight or slightly arcuate capsules which are present on many plants of this species provide a clue to its identity.

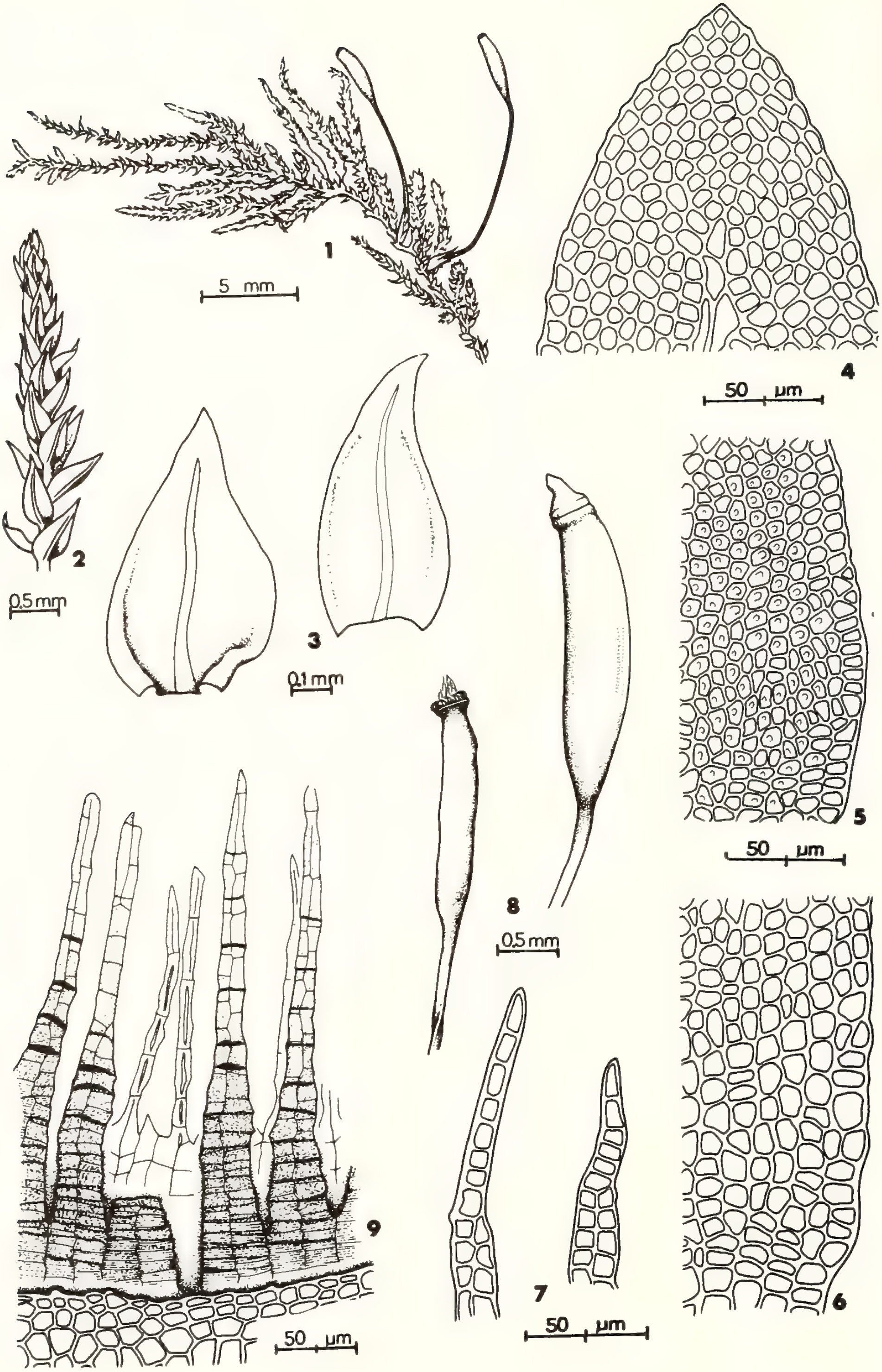
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Plate 250. *Leskea polycarpa*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Paraphyllia. 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome teeth.

2. **Leskeella** (Limpr.) Loeske, Moosfl. Harz. 225. 1903.
Leskea subg. *Leskeella* Limpr., Laubm.
Deutschl. 2: 747. 756. 1895.

Habit: In prostrate, loose mats.

Colour: Dark green, brown or blackish, dull.

Stems: 2–5 cm long, creeping, subpinnately branched, rhizoids sparse, smooth or minutely papillose, in clusters just below juncture of leaves, branches sometimes ascending. Paraphyllia and pseudoparaphyllia lacking.

Leaves: Erect-spreading, erect to appressed when dry, symmetric, concave, biplicate at base, ovate-lanceolate, abruptly subulate, sometimes with secund apices, slightly decurrent. Perichaetial leaves not or weakly costate, lance-acuminate, slightly sheathing.

Leaf Margins: Narrowly recurved or one or both sides to middle or beyond, entire throughout or rarely serrulate at apex.

Costae: Single, percurrent or ending just below apex, prominent below on dorsal surface.

Leaf Cells: Smooth, the walls thick to medium thickness, not pitted. Median and lower cells rhombic or rounded to short subrectangular, apical cells rounded or slightly elongate, marginal basal cells transversely elongate.

Asexual Reproductive Bodies: Axillary clusters of brood branchlets or buds produced in upper portion of some branches.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish.

Capsules: Solitary, on setae scattered along stems, brown to red-brown, oblong-cylindric, erect, straight to slightly arcuate, smooth, contracted below mouth when dry and empty.

Setae: Straight to flexuose, sometimes twisted when dry, red-brown.

Annuli: 1–2 rows of large cells, fragmenting.

Opercula: Conic to obliquely short-rostrate.

Peristomes: Double, 16 exostome teeth, lanceolate, slightly bordered, striate below, coarsely papillose above, inserted near mouth, yellowish, endostome segments linear-lanceolate, roughly papillose, light yellow, cilia rudimentary or lacking.

Spores: Yellow, globose, roughly papillose, 13–18 μm.

1. **Leskeella nervosa** (Brid.) Loeske, Moosfl. Harz. 255. 1903.
Pterigynandrum nervosum Brid., Spec. Musc. 1: 132. 1806.
[Synonyms: *Leskea nervosa* (Brid.) Myr.; *Pseudoleskeella nervosa* (Brid.) Nyh.]
PLATE 251

Plants in prostrate mats, stems subpinnately branched, paraphyllia and pseudoparaphyllia lacking, leaves 0.7–1.2 mm long, erect-spreading, erect to appressed when dry, ovate-lanceolate, abruptly subulate, margins narrowly recurved on one or both sides to leaf middle or beyond, entire throughout or rarely serrulate at apices, costae single, percurrent or ending just below apex, cells smooth, axillary clusters of brood branchlets or buds produced in upper portion of some branches; dioicous, usually lacking sporophytes, setae 0.7–1.2 cm long, capsules 1.0–2.5 mm long, oblong-cylindric, erect, straight to slightly arcuate.

Habitat: On tree trunks, rotten logs and rocks.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Restigouche, Saint John, Victoria, York); Nova Scotia (Colchester, Halifax, Inverness, Kings, Pictou, Victoria).

Range: Greenland to Alaska, south to *Pennsylvania, Michigan, Minnesota, Colorado, and Arizona. Europe, Asia.

Chromosome Number: Unreported.

Remarks: The dark green to almost black plants with ovate-lanceolate leaves that are appressed when dry, the single costae that fill the abruptly subulate apices and the presence of axillary brood branches or buds in the upper portion of some branches will help with the recognition of this species.

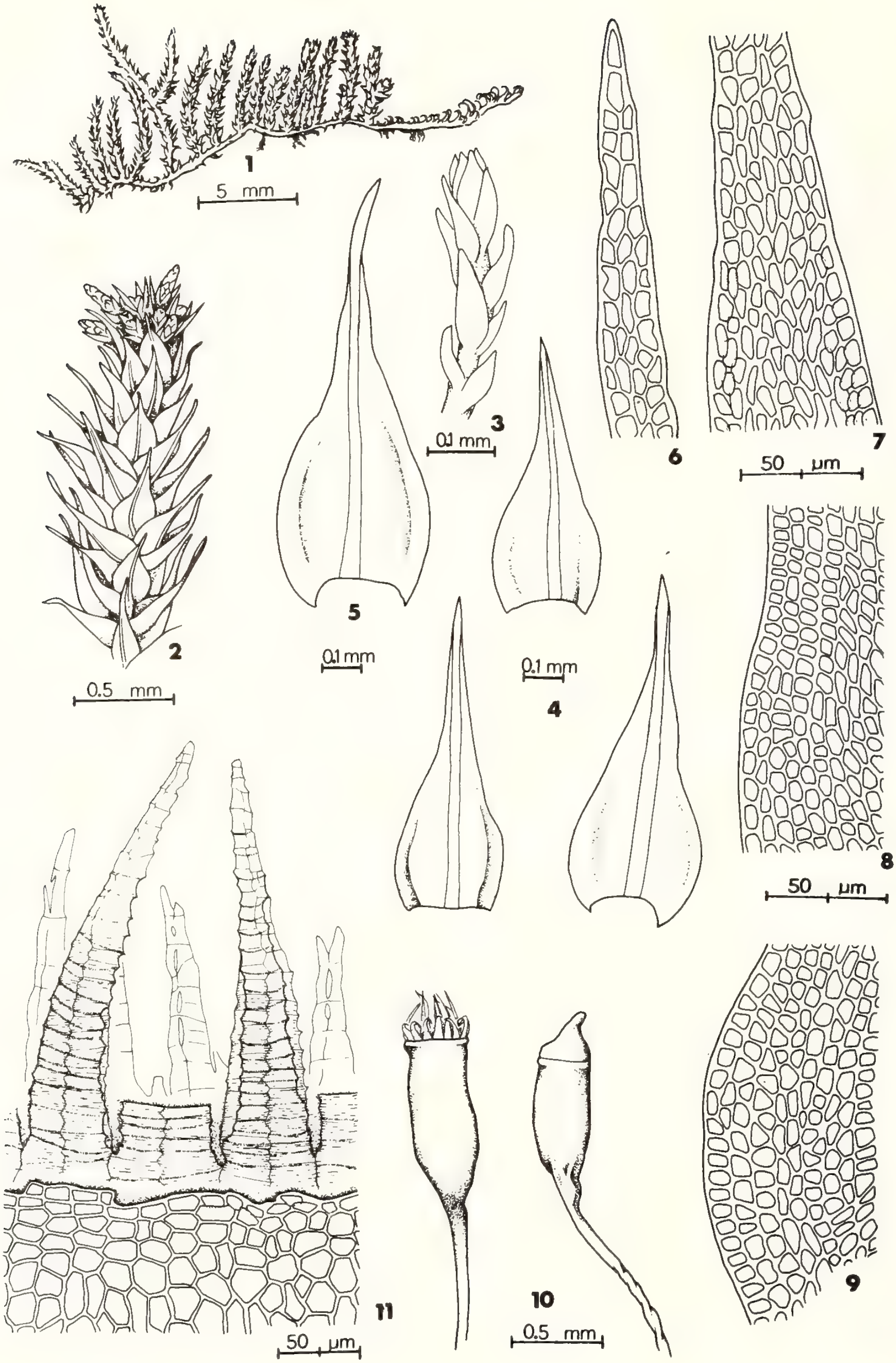
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Plate 251. *Leskeella nervosa*. 1. Habit. 2. Portion of branch with brood branchlets. 3. Enlargement of brood branchlet. 4. Branch leaves. 5. Stem leaf. 6–9. Cells of branch leaf (6, apical. 7, upper cells below apex. 8, median-marginal. 9, alar.). 10. Capsules (dry). 11. Peristome teeth.

3. **Lescuraea** B.S.G., Bryol. Eur. 5: 101. 1851 (fasc. 46–47 Mon. 1.).
[Synonym: *Pseudoleskea* B.S.G.]

Habit: In prostrate, loose mats.

Colour: Yellow-green above, brown to yellow-brown below, dull.

Stems: 0.5–2.0 cm long, creeping or slightly ascending, irregularly branched, rhizoids sparse, smooth or papillose, in clusters just below juncture of leaves, branches somewhat ascending. Paraphyllia numerous on stems and branches, filamentous or foliose, lanceolate.

Leaves: Erect-spreading, appressed with incurved tips when dry, sometimes asymmetric, strongly concave, biplicate, ovate, acuminate, slightly decurrent. Perichaetial leaves weakly costate, broadly lance-acuminate, slightly sheathing.

Leaf Margins: Revolute to middle, plane to reflexed above, entire or serrulate at apex.

Costae: Single, ending below apex, prominent on dorsal surface, rhizoids rarely on dorsal surface near base of leaf.

Leaf Cells: Papillose on both surfaces with a single, conical papilla, the walls of medium thickness, not pitted. Median cells quadrate to isodiametric, becoming oval-oblong at apex and quadrate to short-rectangular at base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Sporophytes unknown on Maritime plants.

Calyptrae: Cucullate, naked, yellowish.

Capsules: Solitary, on setae scattered along stems, brown to red-brown, ellipsoidal, inclined, slightly arcuate, smooth, constricted below mouth when dry and empty.

Setae: Straight to flexuose, twisted above when dry, red-brown.

Annuli: Poorly developed or lacking.

Opercula: Conic to shortly rostrate.

Peristomes: Double, 16 exostome teeth, lanceolate, bordered, finely striolate below, papillose above, inserted below mouth, with well-developed lamellae, yellowish brown, endostome segments lanceolate, finely papillose, yellowish, 1–2 cilia poorly developed or lacking.

Spores: Yellow, globose, roughly papillose, 12–18 μm.

Lawton (1957) has monographed the genus *Lescuraea*.

1. **Lescuraea patens** (Lindb.) H. Arnell & C. Jens., Naturw. Unt. Sarekgeb. 3: 212. 1910.
Lesquereuxia patens Lindb., Medd. Soc. F. Fl. Fenn. 14: 75. 1888.
[Synonym: *Pseudoleskea patens* (Lindb.) Kindb.]
PLATE 252

Plants in prostrate mats, stems irregularly branched, paraphyllia present, numerous, filamentous to foliose, leaves 0.8–1.2 mm long, appressed, ovate, acuminate, margins revolute to middle, plane to reflexed above, entire or serrulate at apices, costae single, ending below apex, cells with a single, conical papilla; dioicous, sporophytes unknown on Maritime plants, reported to have setae 0.7–1.5 cm long, capsules 1.0–1.5 mm long, ellipsoidal, inclined, slightly arcuate.

Habitat: On damp rocks.

Maritime Distribution: Rare. Nova Scotia (Inverness). Collected at Margaree, Big Intervale, 2 July 1952 (*Erskine 52C2050* CANM, NSPM) and in Upper Margaree River, 5 July 1952 (*Erskine 52C2039*, NSPM).

Range: Rare in eastern North America where it is known from *Labrador, Newfoundland, Nova Scotia, *Ontario, *Manitoba, and Michigan; more common in the West from Alaska to California; also in Alberta, Montana, Wyoming, and Utah. Iceland, Europe.

Chromosome Number: Unreported.

Remarks: Capsule and peristome drawn from Newfoundland plants.

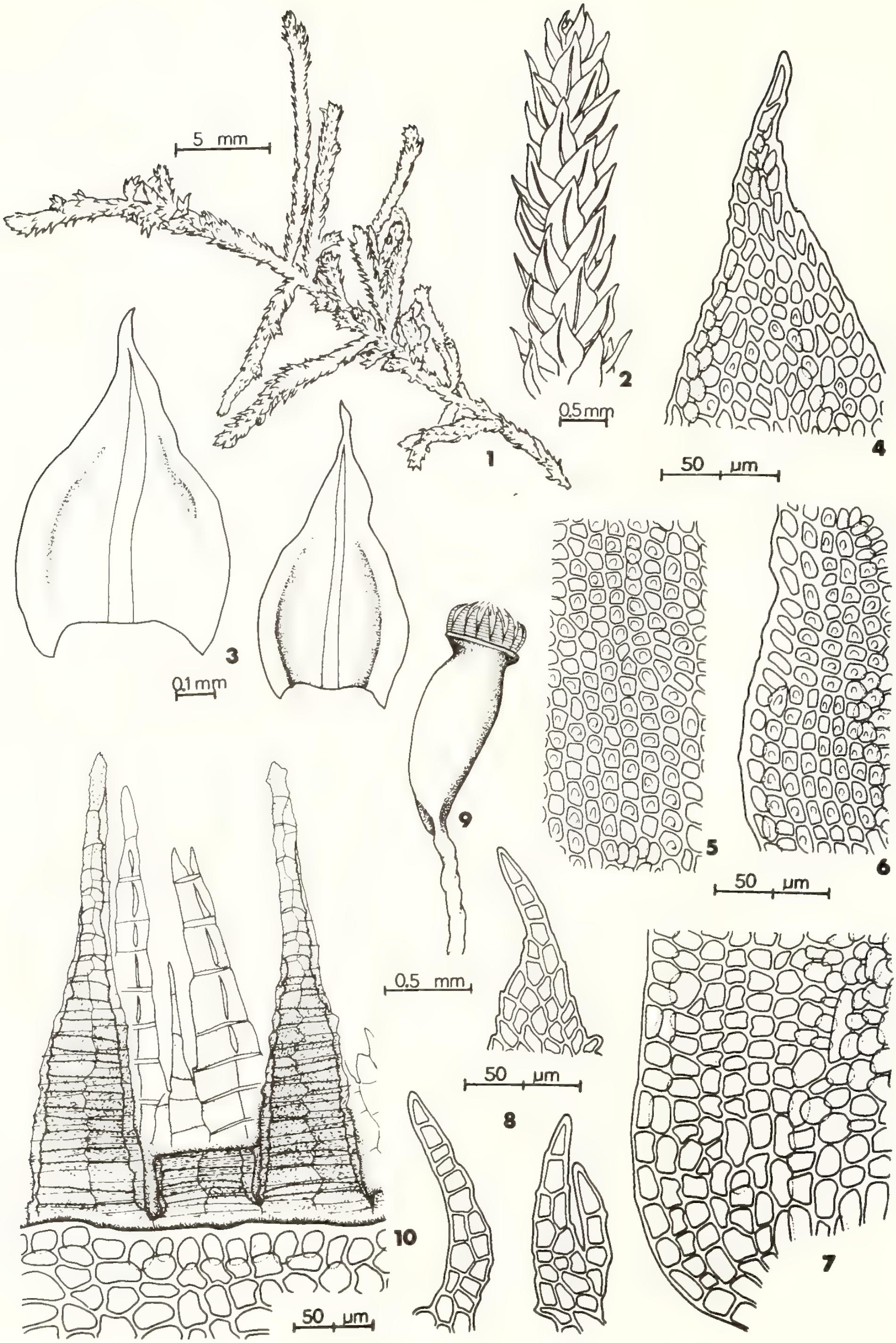
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Plate 252. *Lescuraea patens*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Paraphyllia. 9. Capsule (dry). 10. Peristome teeth.

4. **Pterigynandrum** Hedw., Spec. Musc. 80. 1801.

Habit: In prostrate loose mats.

Colour: Dark to light green, yellow or brown, somewhat glossy, stems reddish.

Stems: 2.0–5.5 cm long, creeping, irregularly branched, rhizoids smooth or minutely papillose, on ventral surface in clusters just below juncture of leaves, branches sometimes ascending and often nearly filiform. Pseudoparaphyllia filamentous.

Leaves: Erect to erect-spreading, erect to appressed and julaceous when dry, symmetric, strongly concave, smooth, elliptic to oblong-ovate, acute to narrowly obtuse, lanceolate, acute, slightly sheathing.

Leaf Margins: Slightly reflexed and entire below, plane and serrulate above.

Costae: Short and double, lacking or sometimes single and extending to middle.

Leaf Cells: Prorate on dorsal surface, the walls thick, basal cells pitted. Upper cells rhombic to oblong-rhomboidal, flexuose, becoming vermicular below, alar cells subquadrate, in small groups.

Asexual Reproductive Bodies: Gemmae in leaf axils rare to common, small, ovoid or cylindric, 2–3 celled, golden-brown.

Sex: Dioicous. Sporophytes unknown on Maritime plants.

Calyptrae: Cucullate, naked, yellowish.

Capsules: Solitary, on setae scattered along stems, yellow-brown, cylindric to oblong-cylindric, erect, straight, smooth or striate at neck.

Setae: Straight or flexuose above, sometimes twisted when dry, red-brown.

Annuli: 1 row of large, long cells, deciduous.

Opercula: High-conic to long-rostrate.

Peristomes: Double, 16 exostome teeth, short-lanceolate, not bordered, obliquely, transversely and vertically striate below, smooth to roughly papillose above, inserted near mouth, yellow-brown below, hyaline above, endostome segments irregularly linear, unequal, short or long, smooth, hyaline, cilia lacking.

Spores: Yellow-brown, globose, papillose, 9–15 μm.

1. **Pterigynandrum filiforme** Hedw., Spec. Musc. 81. 1801.
[Synonyms: *P. filiforme* var. *decipiens* (Web. & Mohr.) Limpr.; *P. filiforme* var. *majus* (De Not.) De Not.]
PLATE 253

Plants in prostrate mats, stems irregularly branched, pseudoparaphyllia present, filamentous, leaves 0.5–1.0 mm long, erect to erect-spreading, concave, erect to appressed and julaceous when dry, elliptic to oblong-ovate, acute to narrowly obtuse, margins plane, sometimes recurved at base, serrulate above, costae short and double, rarely extending 1/4 the leaf length, sometimes lacking or apparently single, cells mostly prorate on dorsal surface, brood-bodies in leaf axils often present, small, ovoid or cylindric, 2–3 celled, golden-brown; dioicous, sporophytes unknown on Maritime plants, reported to have setae 0.5–1.5 cm long, capsules 1.0–2.5 mm long, cylindric, erect, straight or nearly so.

Habitat: On shaded boulders and cliffs in woods, sometimes on tree trunks, usually deciduous.

Maritime Distribution: Common. New Brunswick (Alberta, Charlotte, Queen's, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Victoria); Prince Edward Island (Queens).

Range: Greenland to Alaska, south to North Carolina, Tennessee, Michigan, Minnesota, Colorado, and California. *West Indies, Europe, Asia, *Africa.

Chromosome Number: n = 11.

Remarks: The green to yellowish green, small, slender, julaceous plants, with irregularly branched, red stems and the elliptic to oblong-ovate leaves with mostly acute apices and short, double costae are key macroscopic characters. The dorsally prorate leaf cells and the usual presence of 2–3 celled, ovoid or cylindric brood bodies are microscopic features that aid in its identification.

The plants are always without sporophytes in the Maritimes. The capsules and peristome teeth were drawn from Quebec plants.

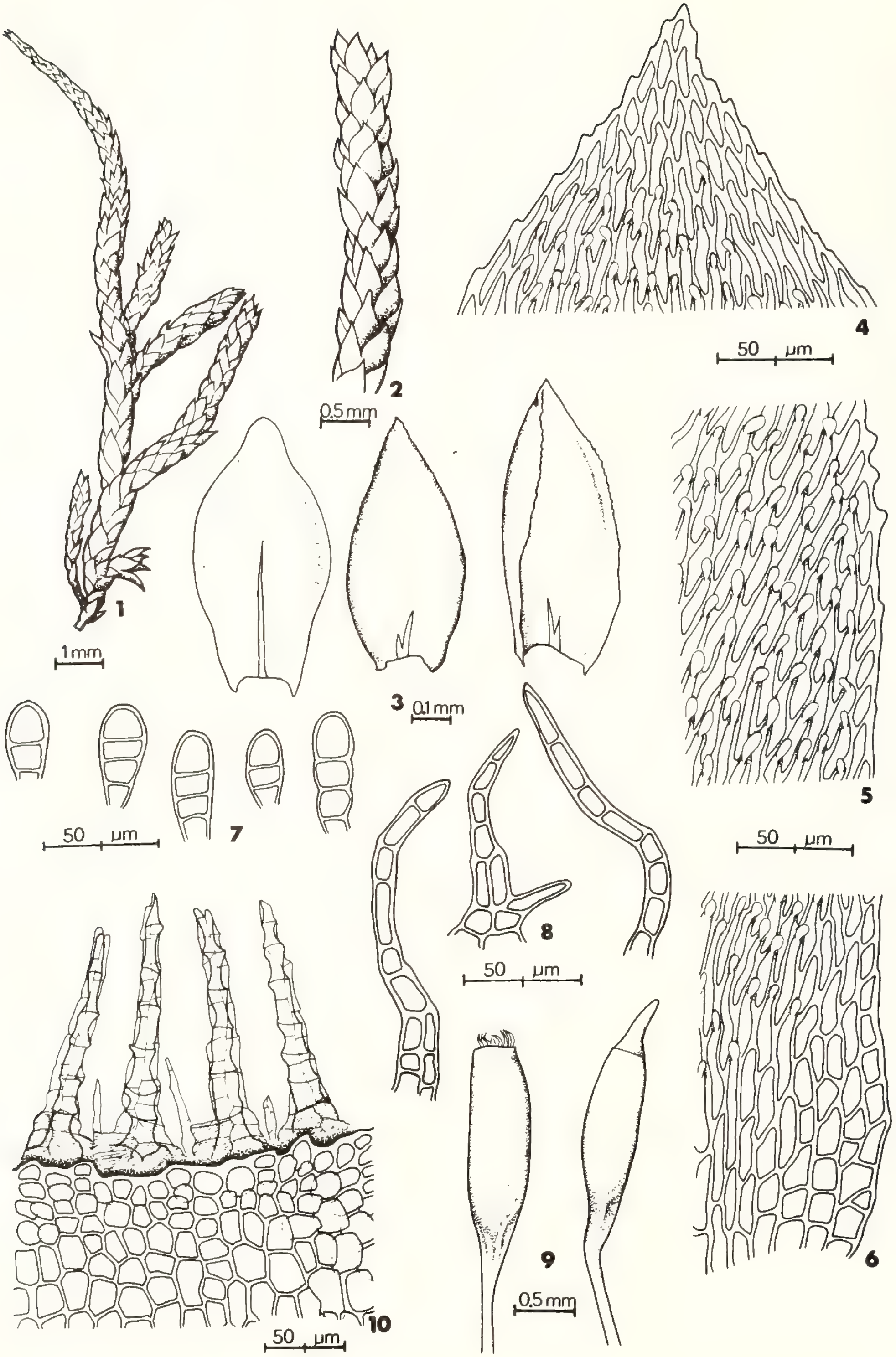
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Plate 253. *Pterigynandrum filiforme*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Gemmae. 8. Pseudoparaphyllia. 9. Capsules (dry). 10. Peristome teeth.

5. **Thelia** Sull., Man. Bot. No. U.S. ed. 2: 660. 1856.

Habit: In prostrate mats, with erect, dense, rigid branches.

Colour: Green, yellow-green, yellow-brown, grayish green, becoming brown with age, dull.

Stems: 5 cm long or more, prostrate, closely 1-pinnate, densely radiculose on undersurface, branches 1–6 mm long, erect-ascending, slightly to strongly julaceous. Paraphyllia frequent on stems, scarce on branches, foliose, ciliate on margins.

Leaves: Stem leaves erect-spreading, branch leaves julaceous, scarcely altered when dry, strongly concave, unistratose, deltoid-ovate, with a long, flexuose, slightly recurved, apiculate or filiform acumen, slightly decurrent. Perichaetial leaves weakly costate, sheathing.

Leaf Margins: Plane, stem leaf margins strongly and irregularly ciliate, branch leaf margins irregularly dentate, sometimes spinose-ciliate near base. Perichaetial leaf margins with toothed, flexuose cilia.

Costae: Single, occasionally double and short, slender, extending $^1/_2$–$^3/_4$ the leaf length, dorsally papillose above.

Leaf Cells: Dorsally unipapillose, with simple, blunt, curved papillae, the walls thick to medium thickness, not pitted. Median cells rhomboidal, becoming longer at base and apex, shortly oblong to quadrate at lower margins.

Asexual Reproductive Bodies: Lacking.

Sex: Pseudomonoicous. Dwarf male plants on leaves or tomentum of female plants.

Calyptrae: Cucullate, naked.

Capsules: Solitary, on setae scattered along stems and branch bases, yellow to yellowish brown, cylindric to ovoid-cylindric, straight, usually erect, sometimes inclined, smooth.

Setae: Straight, sometimes flexuose above, twisted above when dry, yellow to yellow-brown.

Annuli: None or slightly differentiated in 2 rows, fragmenting.

Opercula: Conic to obliquely rostrate.

Peristomes: Double, 16 exostome teeth, narrowly lanceolate, smooth below, densely papillose above, white, endostome consisting of a low basal membrane with segments short, rudimentary or lacking.

Spores: Yellow, globose, finely papillose, 14–21 μm.

1. **Thelia hirtella** (Hedw.) Sull., Man. Bot. No. U.S. ed. 2: 660. 1856.

Pterigynandrum hirtellum Hedw., Spec. Musc. 83. 1801.

PLATE 254

Plants in prostrate mats, yellowish- or grayish-green, stems once pinnate, branches erect-ascending, julaceous, foliose paraphyllia with ciliate margins on stems and branches, leaves 1.0–1.5 mm long, deltoid-ovate, concave, often with filiform acumen, margins strongly ciliate, costae usually single, cells rhomboidal, dorsally unipapillose, the papillae simple, long, blunt, curved; pseudomonoicous, setae 5–10 mm long, capsules 1.5–2.5 mm long, erect to inclined, cylindric to ovoid-cylindric.

Habitat: On bases of trees.

Maritime Distribution: Frequent. New Brunswick (Queen's); Nova Scotia (Annapolis, Digby, Halifax, Queens, Shelburne, Yarmouth).

Range: Nova Scotia to southern Ontario, south to Florida, Mississippi, Louisiana, and Texas. Mexico.

Chromosome Number: n = 11.

Remarks: Crum (1966) monographed *Thelia* which is endemic to eastern North America and contains only three species.

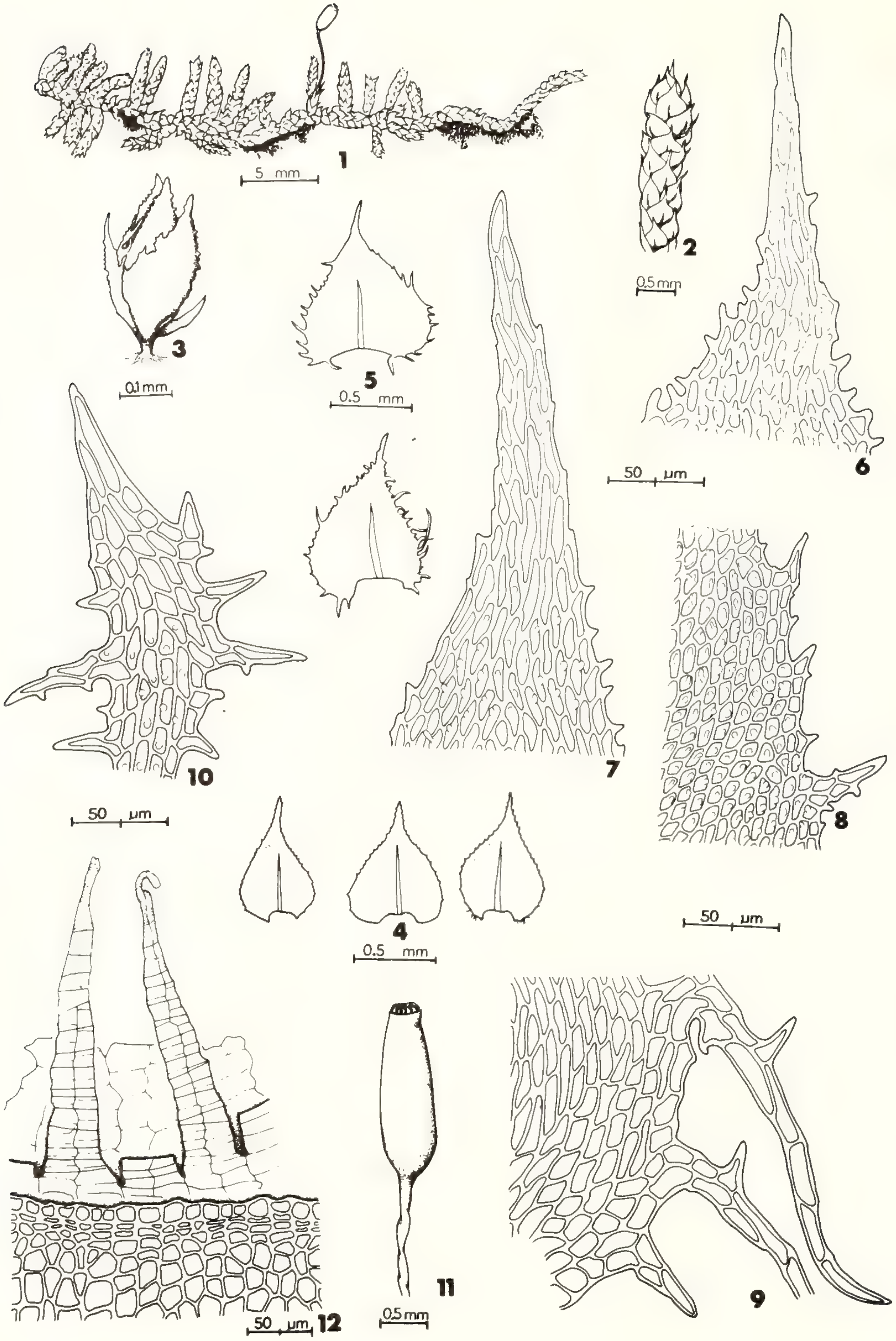
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Plate 254. *Thelia hirtella*. 1. Habit. 2. Portion of branch. 3. Male plant. 4. Branch leaves. 5. Stem leaves. 6–9. Leaf cells (6, apical of branch leaf. 7, apical of stem leaf. 8, median-marginal of branch leaf. 9, alar of branch leaf.). 10. Paraphyllium. 11. Capsule (dry). 12. Peristome teeth.

6. **Haplohymenium** Dozy & Molk., Musci Fr. Ined. Archip. Indici 127. 40. 1846. *nom. cons.*

Habit: In prostrate, loose mats.

Colour: Green to yellowish green, becoming brown with age, dull.

Stems: 1–3 cm long, filiform, creeping, irregularly to subpinnately branched, rhizoids smooth or papillose, in clusters just below juncture of leaves on ventral surface of stems. Paraphyllia and pseudoparaphyllia lacking.

Leaves: Stem and branch leaves similar, wide-spreading to squarrose, imbricate when dry, lingulate or lanceolate from a broad, clasping, decurrent, ovate base, abruptly narrowed above, acute, apiculate or obtuse, the upper portion usually broken off.

Leaf Margins: Plane, crenulate due to bulging papillose cells.

Costae: Single, ending near middle of leaf, weak and scarcely noticeable on dorsal surface.

Leaf Cells: Multipapillose, the walls thin to thick, lacking pits. Median cells hexagonal to round, nearly the same size and shape throughout leaf.

Asexual Reproductive Bodies: No specialized bodies present but presumably reproducing asexually by leaf tips which are readily deciduous.

Sex: Dioicous. Female plants seen in the Maritimes but male plants and sporophytes unknown. Description of sporophyte from reports based on Japanese plants.

Calyptrae: Cucullate, lobed at base, rough at apex, bearing few to several, erect, long hairs, brown.

Capsules: Solitary, on setae scattered along stems, brownish, broadly ellipsoidal, straight, erect, stomata lacking.

Setae: Relatively short, 4–5 mm long.

Annuli: Well-developed, narrow, fragmenting.

Opercula: Long-rostrate from a convex-conic base, somewhat oblique.

Peristomes: Exostome teeth short, linear-lanceolate, pale yellowish, covered with large papillae on the upper portion, endostome a smooth, low, inconspicuous membrane.

Spores: Spherical, densely papillose, 15–25 μm.

1. **Haplohymenium triste** (Ces. *ex* De Not.) Kindb., Rev. Bryol. 26: 25. 1899.
Leskea tristis Ces. *ex* De Not., Syll. 67. 1838.
[Synonym: *Anomodon tristis* (Ces. *ex* De Not.) Sull. & Lesq.]
PLATE 255

Filamentous plants with the appearance of a small *Anomodon*. Stems irregularly branched, leaves wide-spreading to squarrose, imbricate when dry, lingulate to lanceolate from an abruptly narrowed ovate base and with the upper part of most of the leaves broken off.

Habitat: On tree trunks and rock outcrops in woods.

Maritime Distribution: Rare. New Brunswick (York); Nova Scotia (Annapolis, Halifax, Kings, Shelburne).

Range: Only in eastern North America, occurring from Nova Scotia to *Minnesota, south to Florida and Louisiana. *Central America, Europe, Asia, Hawaiian Islands.

Chromosome Number: n = 11.

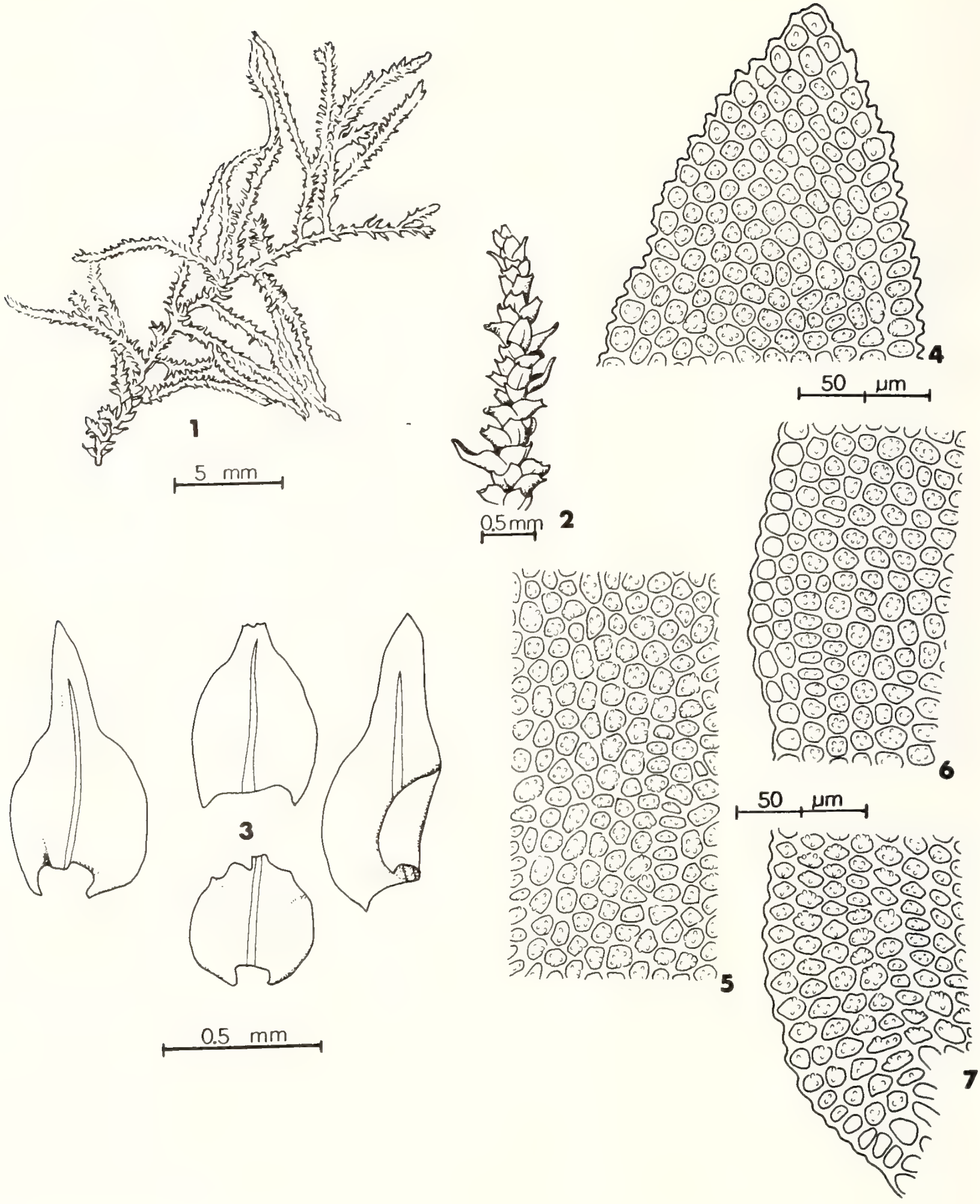
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Plate 255. *Haplohymenium triste*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.).

7. **Anomodon** Hook. & Tayl., Musc. Brit. 79. 3. 1818.

Habit: In prostrate or ascending, loose to dense mats.

Colour: Dark green to yellowish green, brown near base, dull.

Stems: Primary stems slender, creeping, secondary stems ascending, 0.4–6.0 cm long, sometimes branched, rhizoids smooth or papillose, in clusters on primary stems just below juncture of leaves and on base of branches. Paraphyllia lacking. Pseudoparaphyllia present on stems of *A. rugelii*, foliose, narrowly lanceolate.

Leaves: Primary stem leaves smaller than branch leaves, enlarged at base, clasping stem, branch leaves erect to wide-spreading, often twisted and contorted when dry, lingulate or lanceolate, from an oblong or ovate base, acute, acuminate or obtuse, often apiculate, decurrent. Perichaetial leaves sheathing base of seta, spreading to squarrose in upper half, membraneous, pale.

Leaf Margins: Plane or revolute (*A. rostratus*), entire or irregularly dentate at apex, sometimes fimbriate at base.

Costae: Single, subpercurrent, prominent on dorsal surface, often orange or red.

Leaf Cells: Multipapillose, the walls thin to thick, lacking pits. Median cells hexagonal to round, sometimes becoming longer at apex.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on setae scattered along secondary stems, light brown to dark brown, cylindric to oblong-cylindric, sometimes ovoid, straight, erect, smooth, sometimes furrowed when dry.

Setae: Straight to flexuose, smooth, not or little twisted when dry, light brown to dark brown.

Annuli: 2–3 rows of small cells, deciduous, sometimes lacking.

Opercula: Conic to short-rostrate, straight to slightly arcuate.

Peristomes: Double, 16 exostome teeth, lanceolate, white to yellow or orange, endostome segments linear-lanceolate, hyaline to yellow, 1–3 cilia, short, rudimentary, sometimes lacking.

Spores: Green to brownish green or brown, globose to ovoid, smooth to finely papillose, 10–19 μm in longest dimension.

1. Leaves with a long-filiform acumen; leaf margins revolute .... 1. *A. rostratus*
1. Leaves apiculate, acute or obtuse; leaf margins plane 2
  2. Plants usually with attenuate branches (especially noticeable when dry); branch leaves gradually narrowed to an acute apex, scarcely contorted when dry .... 2. *A. attenuatus*
  2. Plants lacking attenuate branches; branch leaves obtuse or apiculate, strongly contorted when dry 3
    3. Plants small, branches up to 5 cm long; branch leaves 2 mm long or less, auriculate at base, basal cells fimbriate-papillose on margins of auricles .... 3. *A. rugelii*
    3. Plants large, branches up to 10 cm long; branch leaves often over 2 mm long, without auricles at base, basal cells crenulate-papillose on margins .... 4. *A. viticulosus*

1. Anomodon rostratus (Hedw.) Schimp., Syn. 488. 1860.

Leskea rostrata Hedw., Spec. Musc. 226. 1801.

PLATE 256

Unlikely to be confused with the other species of *Anomodon* because of the leaves with hyaline hair-points and revolute margins.

Habitat: On rocks and in cliff crevices that are frequently calcareous, on bases of trees and humus.

Maritime Distribution: Common. New Brunswick (Albert, Queen's, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Guysborough, Hants, Inverness, Kings, Shelburne, Victoria).

Range: Widespread in eastern North America, Newfoundland to Saskatchewan, south to Florida, Louisiana, Texas, New Mexico, and Arizona; also in *British Columbia? Mexico, West Indies, Europe, *Asia.

Chromosome Number: $n = 11$.

2. Anomodon attenuatus (Hedw.) Hüb., Musc. Germ. 562. 1833.

Leskea attenuata Hedw., Spec. Musc. 230. 1801.

PLATE 257

The attenuate branches are the most notable feature of this species of *Anomodon* but the plants need to be dry to clearly observe them.

Habitat: On tree trunks, rocks, cliff shelves and soil at bases of trees.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Queen's, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Antigonish, Colchester, Cumberland, Digby, Halifax, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings).

Range: Widespread in eastern North America, Newfoundland to Manitoba, south to Florida, Louisiana, Texas, New Mexico, and Arizona; also in *British Columbia? West Indies, *Central America, Europe, *Asia.

Chromosome Number: n = 11.

3. Anomodon rugelii (C. Müll.) Keissl., Ann. Naturh. Hofmus. Wien 15: 214. 1900.

Hypnum rugelii C. Müll., Syn. 2: 473. 1851.

PLATE 258

Best recognized by the leaf apices that are apiculate and irregularly dentate and by the fimbriate-papillose auricles at the base of the leaves.

Habitat: On bases of trees and stumps.

Maritime Distribution: Frequent. New Brunswick (Victoria); Nova Scotia (Digby, Halifax, Kings).

Range: In eastern North America, from Nova Scotia to Ontario, south to Georgia and Tennessee. Europe, Asia.

Chromosome Number: n = 11.

4. Anomodon viticulosus (Hedw.) Hook. & Tayl., Musc. Brit. 79. 1818.

Neckera viticulosa Hedw., Spec Musc. 209. 1801.

PLATE 259

The largest species of *Anomodon* in the Maritimes, with secondary stems up to 10 cm long, bearing leaves that are 2–3 mm long.

Habitat: On limestone ledges, rocks and rarely on tree trunks.

Maritime Distribution: Frequent. New Brunswick (King's, Saint John); Nova Scotia (Cumberland, Hants, Inverness).

Range: In eastern North America, from Nova Scotia to Ontario, south to New York, Tennessee, and Arkansas. Europe, Asia, *Africa.

Chromosome Number: n = 11.

Remarks: Sometimes confused with *A. rugelii* but differing by the robust plants that have leaves without fimbriate-papillose basal-marginal cells.

Another species, *A. minor* (Hedw.) Fürnr., which is likely to be confused with *A. viticulosus* and *A. rugelii* should be sought in the Maritimes. It has broadly obtuse leaves and lacks the fimbriate papillae on the basal-marginal cells.

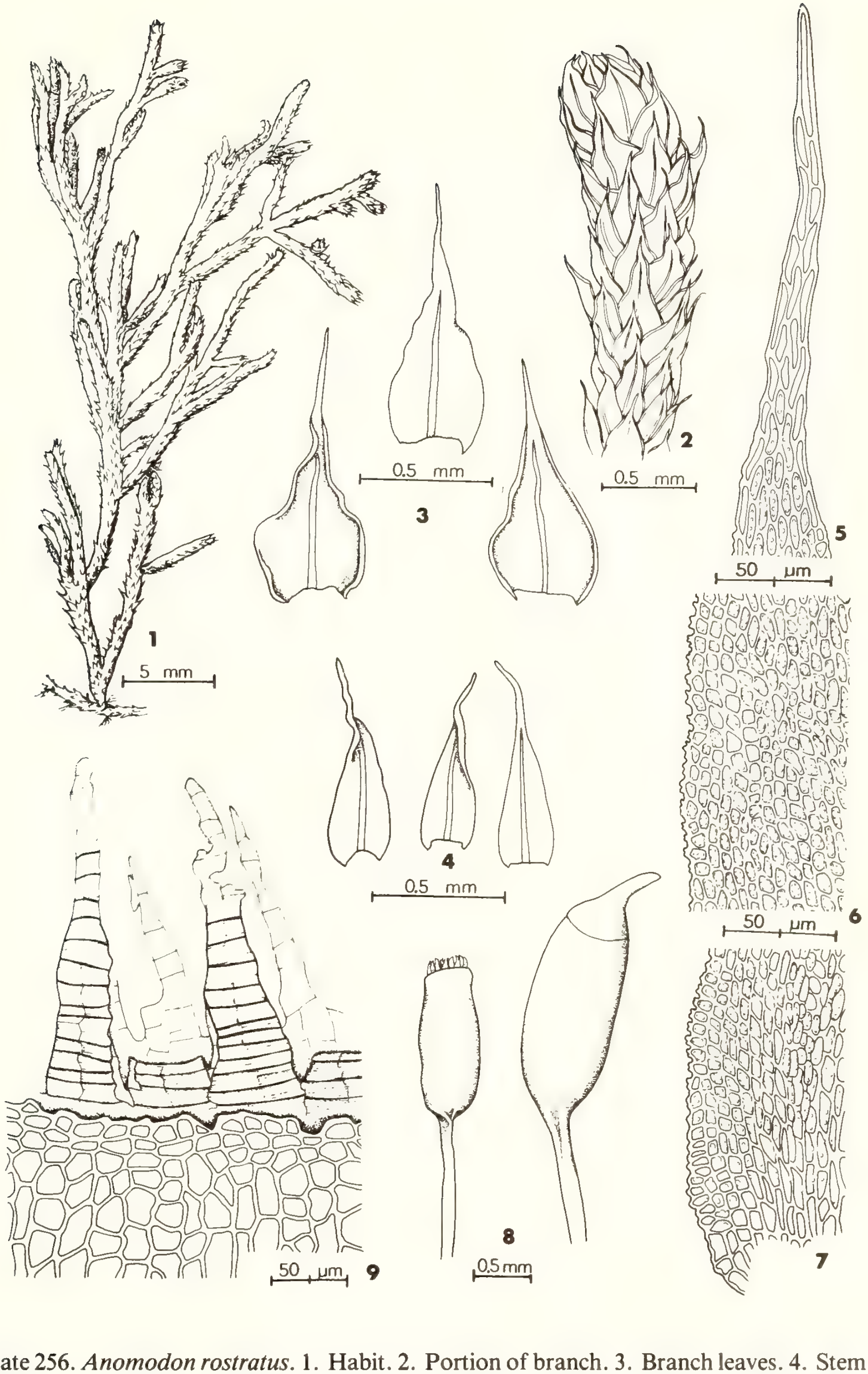
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Plate 256. *Anomodon rostratus*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–7. Cells of branch leaf (5, apical. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome teeth.

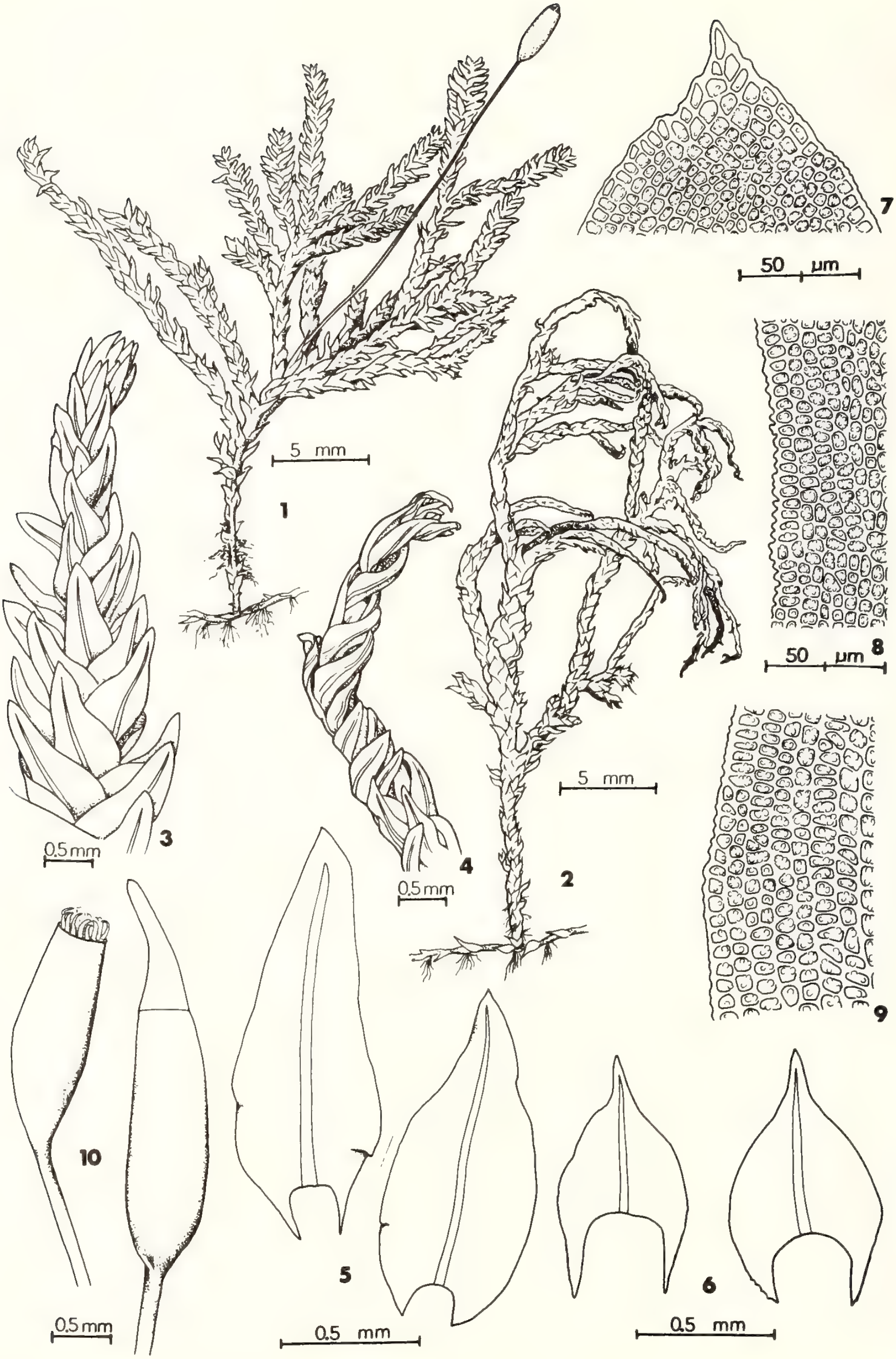
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Plate 257. *Anomodon attenuatus*. 1. Habit (wet). 2. Habit (dry). 3. Portion of branch (wet). 4. Portion of branch (dry). 5. Branch leaves. 6. Stem leaves. 7–9. Cells of branch leaf (7, apical. 8, median-marginal. 9, alar.). 10. Capsules, operculate (wet), inoperculate (dry).

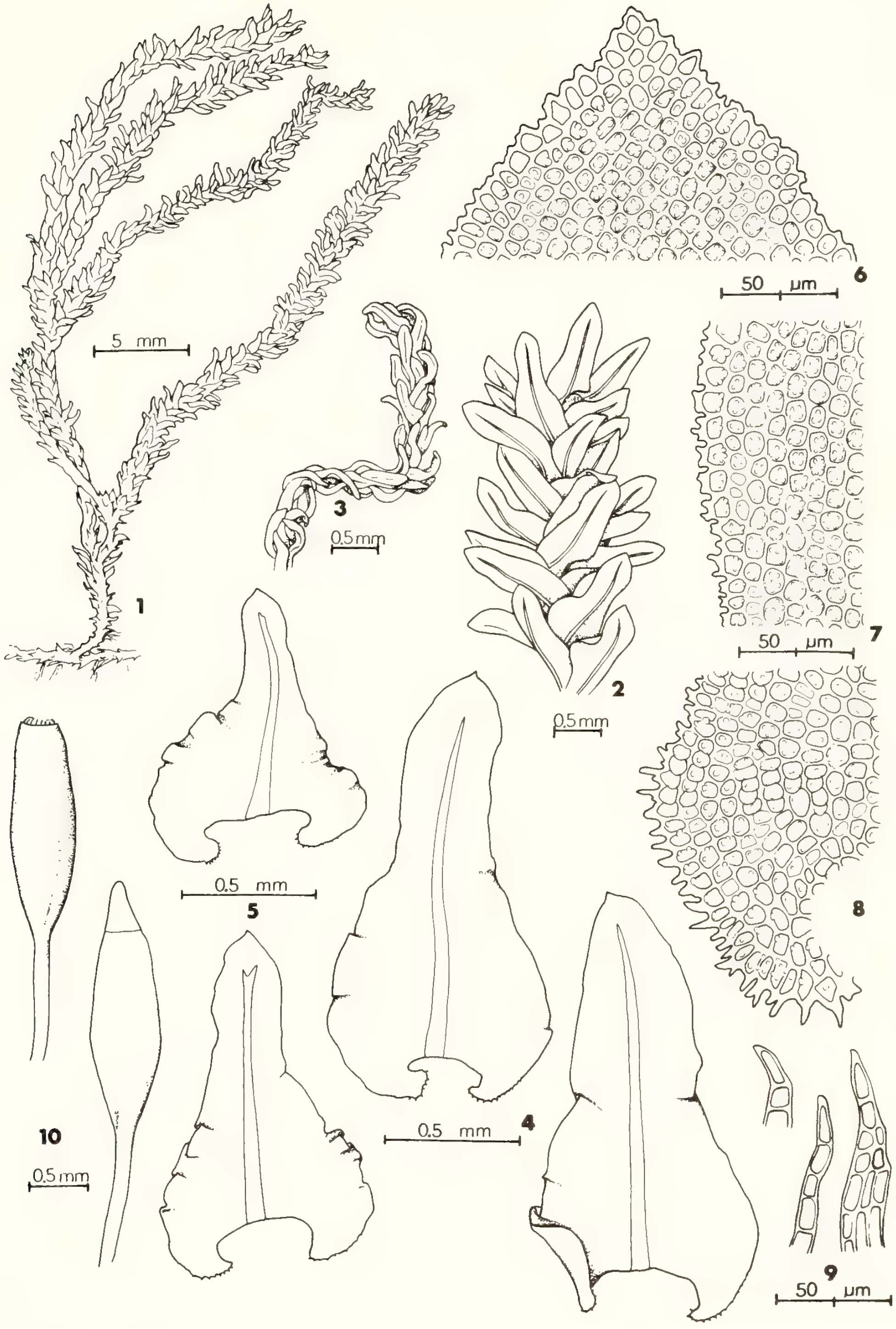
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Plate 258. *Anomodon rugelii*. 1. Habit. 2. Portion of branch (wet). 3. Portion of branch (dry). 4. Branch leaves. 5. Stem leaves. 6–8. Cells of branch leaf (6, apical. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

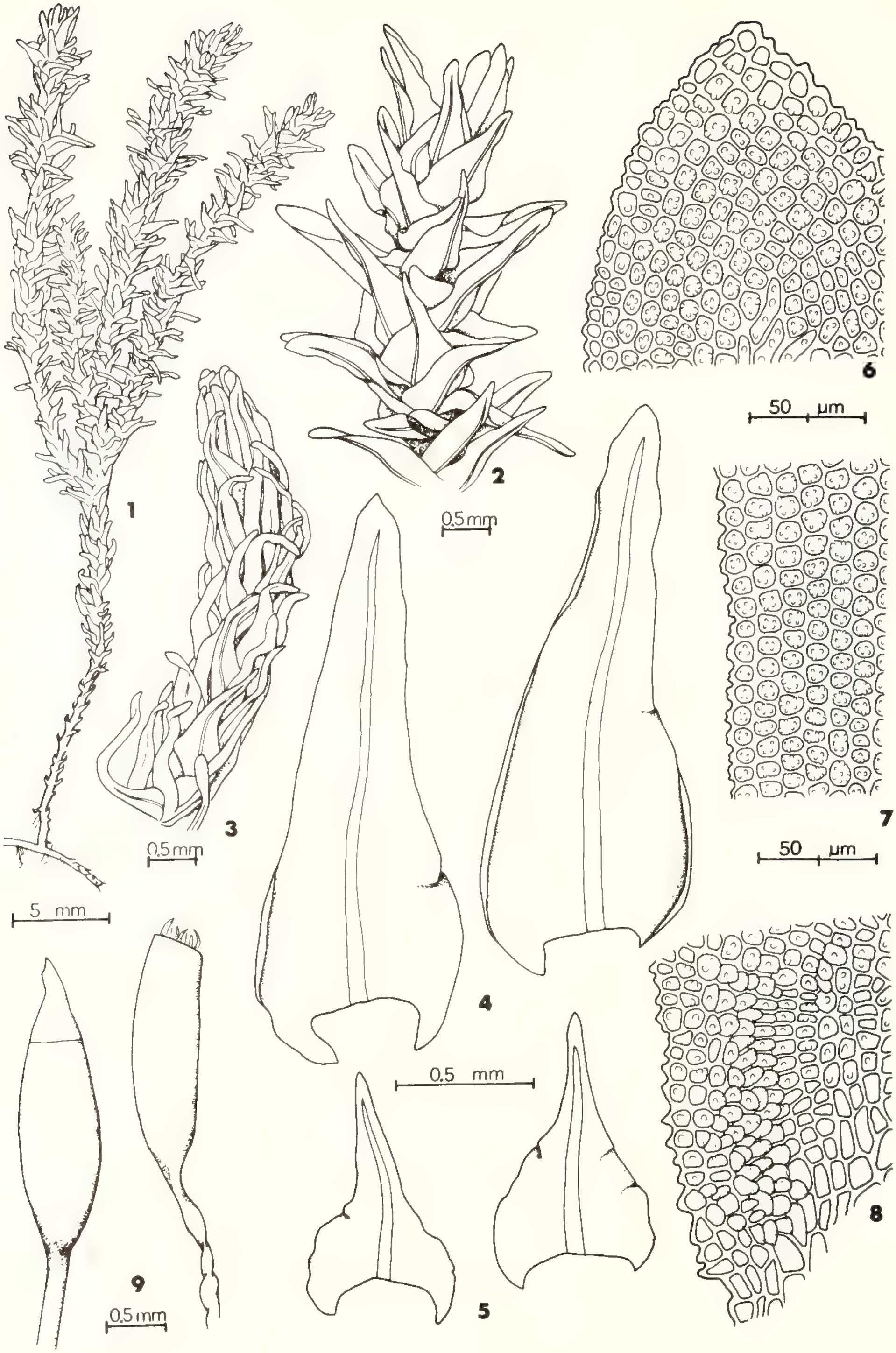
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Plate 259. *Anomodon viticulosus*. 1. Habit. 2. Portion of branch (wet). 3. Portion of branch (dry). 4. Branch leaves. 5. Stem leaves. 6–8. Cells of branch leaf (6, apical. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

Family THUIDIACEAE

1. Costae lacking or short and double, weak 2
    2. Plants sparsely branched; stem and branch leaves similar or nearly so, margins serrulate to spinulose; paraphyllia lacking .... 1. *Myurella* (p. 457)
    2. Plants subpinnately branched; stem and branch leaves differentiated, margins serrulate to serrate; paraphyllia present, foliose .... 2. *Heterocladium* (p. 461)
1. Costae single, strong 3
    3. Plants pinnate; leaf cells prorate or unipapillose on dorsal surface at upper ends of cells; paraphyllia filamentous, cells smooth .... 5. *Helodium* (p. 474)
    3. Plants 1–3 pinnate; leaf cells unipapillose, papillae central, or multipapillose; paraphyllia foliose, rarely filamentous, cells papillose 4
        4. Apical cell of branch leaves unipapillose .... 3. *Haplocladium* (p. 463)
        4. Apical cell of branch leaves multipapillose .... 4. *Thuidium* (p. 466)

1. Myurella B.S.G., Bryol. Eur. 6: 39. 1853 (fasc. 52-54 Mon. 1).

Habit: In erect-ascending or ± prostrate, loose or dense, rigid mats.

Colour: Light green or yellow-green, glaucous, dull.

Stems: 0.5–3.0 cm long, erect-ascending or prostrate, forked or irregularly branched, sometimes stoloniform-attenuate, with scattered rhizoid tufts, stems and branches slightly to strongly julaceous. Paraphyllia lacking.

Leaves: Imbricate or erect- to wide-spreading, little altered when dry, strongly concave, unistratose, rounded-ovate or broadly ovate, rounded-obtuse to short- to long-apiculate, nondecurrent. Perichaetial leaves ecostate, ovate-lanceolate, acuminate, sheathing.

Leaf Margins: Plane, serrulate to spinulose-dentate throughout.

Costae: Short and double, one fork often longer, extending to $^1/_3$ the leaf length, sometimes lacking.

Leaf Cells: Smooth or dorsally prorate or with one large papilla over the lumen, the walls thick to medium thickness, not pitted. Median and apical cells rhombic, becoming elliptic or subquadrate at base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked.

Capsules: Solitary, on setae scattered along stems, brown to yellow-brown, oblong-ovoid to ovoid-cylindric, straight or arcuate, erect to inclined, smooth.

Setae: Straight to flexuose above, sometimes twisted when dry, yellow to yellow-brown.

Annuli: 2 rows of large cells, deciduous.

Opercula: Conic or conic-apiculate.

Peristomes: Double, 16 exostome teeth, lance-subulate, narrowly bordered, cross-striolate below, papillose above, yellow or yellow-brown, endostome consisting of 16 segments, linear-lanceolate, finely papillose, hyaline, 1–2 cilia, appendiculate.

Spores: Yellow, globose, smooth to finely papillose, 9–17 μm.

1. Plants julaceous, leaves close, imbricate, apiculate or sometimes obtuse, margins serrulate .... 1. *M. julacea*
1. Plants not or rarely somewhat julaceous, leaves distant, spreading, acuminate, sometimes abruptly so, margins serrulate to spinulose .... 2. *M. sibirica*

1. Myurella julacea (Schwaegr.) B.S.G., Bryol. Eur. 6: 41. 560. 1853 (fasc. 52–54 Mon. 3.*1*).
Leskea julacea Schwaegr., Reise Glockner 2: 363. 1804.
PLATE 260

The julaceous stems and branches, with imbricate, concave, broadly ovate leaves, obtuse to apiculate apices and serrulate margins will distinguish this species from *M. sibirica*.

Habitat: In crevices and on soil over ledges of calcareous cliffs.

Maritime Distribution: Rare. New Brunswick (Charlotte, Restigouche, Victoria); Nova Scotia (Victoria).

Range: Greenland to Alaska, south to *New York, Michigan, Wisconsin, Minnesota, Colorado, and *Oregon. Europe, Asia.

Chromosome Number: Unreported.

2. Myurella sibirica (C. Müll.) Reim., Hedwigia 76: 292. 1937.
Hypnum sibiricum C. Müll., Syn. 2: 418. 1851.
[Synonym: *M. careyana* Sull.]
PLATE 261

Differing from *M. julacea* by the nonjulaceous stems and branches and the distant, erect- to wide-spreading leaves, usually with slender acumens and spinulose margins.

Habitat: In crevices and on soil over ledges of calcareous cliffs.

Maritime Distribution: Common. New Brunswick (Albert, Madawaska, Queen's, Restigouche, Saint John, Victoria); Nova Scotia (Cape Breton, Colchester, Cumberland, Guysborough, Inverness, Hants, Kings, Victoria).

Range: Newfoundland to Alaska, south to North Carolina, Indiana, and Arkansas. *Europe, Asia.

Chromosome Number: Unreported.

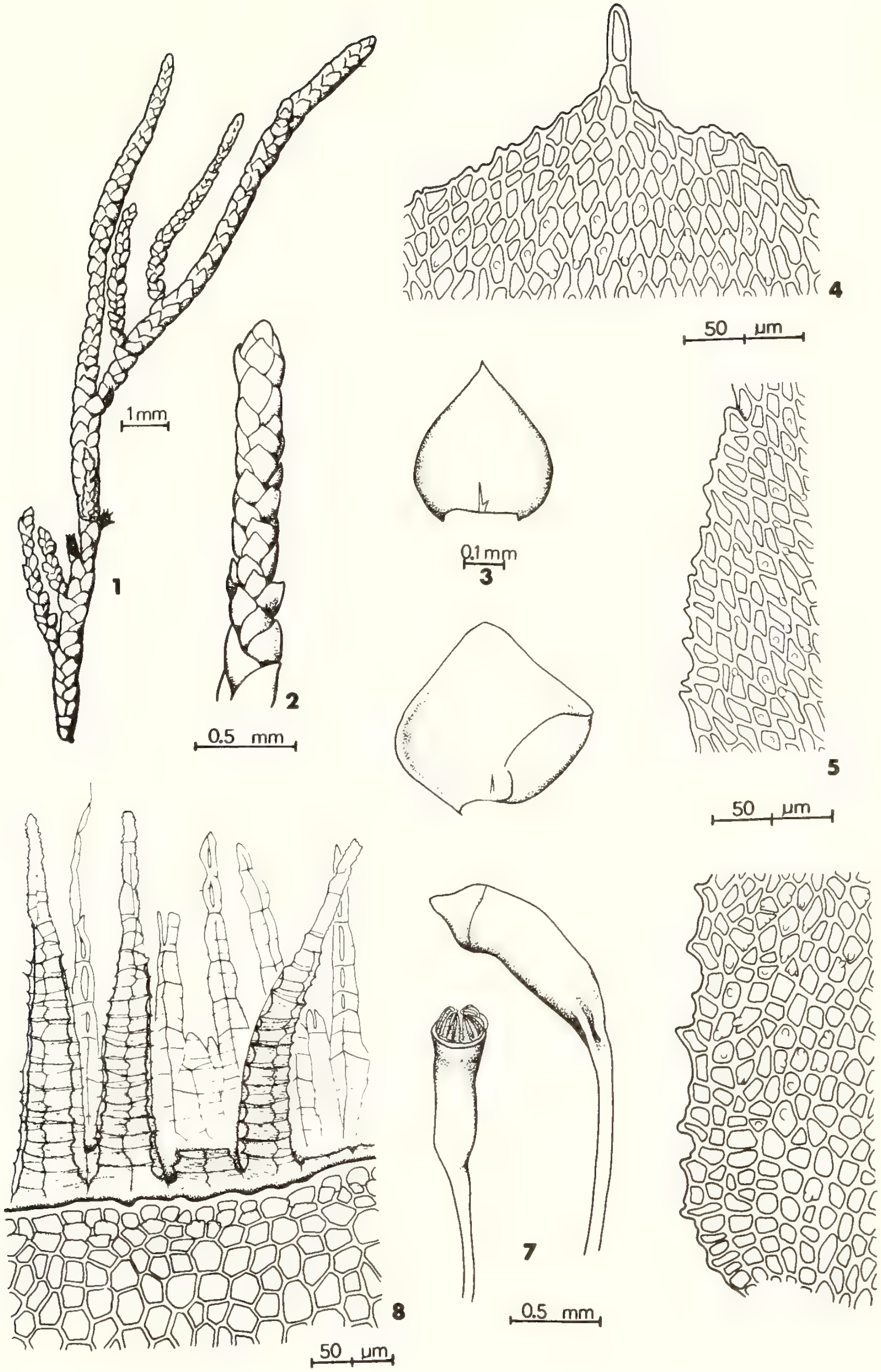
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Plate 260. *Myurella julacea*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry). 8. Peristome teeth.

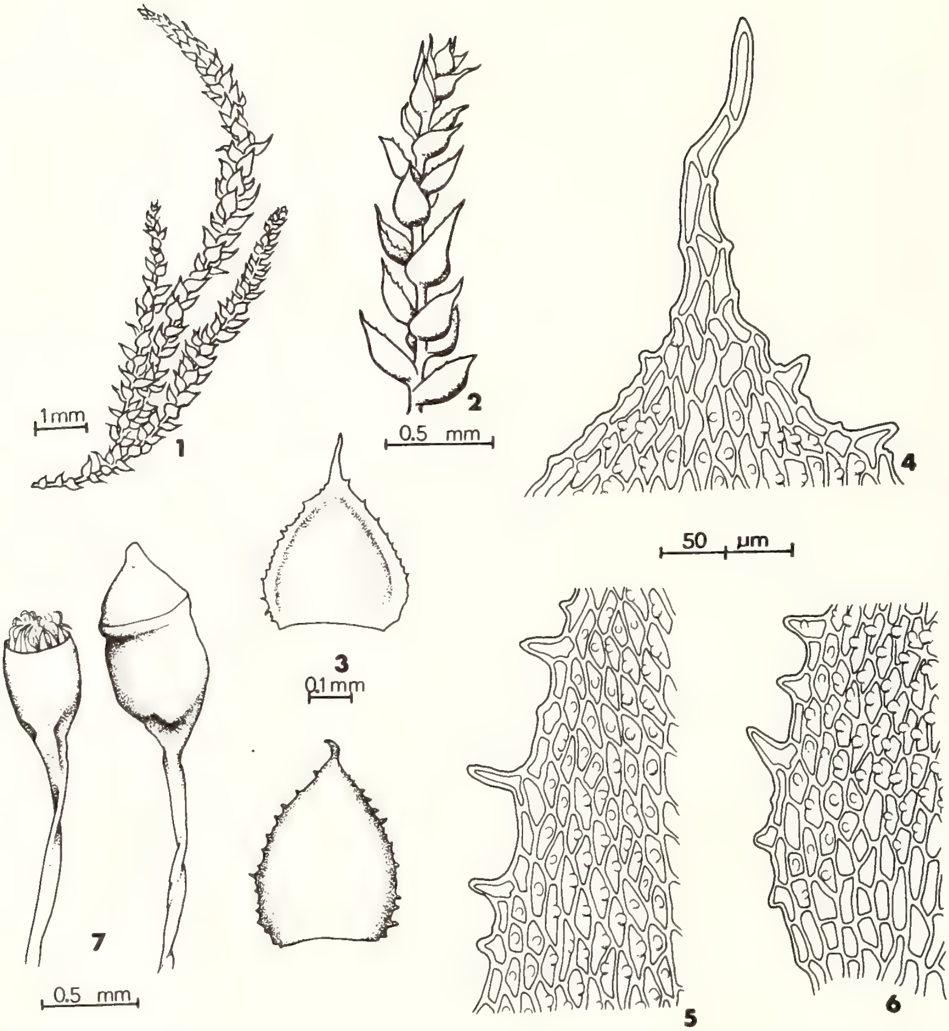
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Plate 261. *Myurella sibirica*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Capsules (dry).

2. **Heterocladium** B.S.G., Bryol. Eur. 5: 151. 1852 (fasc. 49–51 Mon. 1).

Habit: In prostrate, loose to dense mats.
Colour: Dark green to yellowish green or yellowish brown, dull.
Stems: 2–6 cm long, creeping, subpinnately branched, rhizoids papillose, in clusters just below juncture of leaves on ventral surface of stems. Paraphyllia on stems and branches, few, foliose, rarely ciliate at base.
Leaves: Stem leaves erect-spreading to squarrose, somewhat contorted at apex when dry, abruptly narrowed to a recurved acumen from a cordate-ovate base, clasping stem, shortly decurrent, branch leaves considerably differentiated, erect-spreading, imbricate when dry, oblong-ovate to ovate, acute to obtuse, shortly decurrent. Perichaetial leaves sheathing base of seta, spreading to squarrose in upper half, lanceolate, long-acuminate, thin.
Leaf Margins: Plane, serrate to serrulate throughout.
Costae: Double, usually 1/3–1/2 the leaf length, rarely extending above leaf middle, thin, indistinct.
Leaf Cells: Prorate on dorsal surface, the walls thick, cells pitted in central portion of leaf from base to leaf middle. Median cells oblong-fusiform or oblong-rhomboidal, becoming rhombic, rounded or irregularly angled toward margins.
Asexual Reproductive Bodies: Lacking.
Sex: Dioicous.
Calyptrae: Cucullate, naked, yellowish, fugacious.
Capsules: Solitary, on setae scattered along stems, light brown to reddish brown, oblong-cylindric, arcuate, inclined to horizontal, smooth, sometimes slightly contracted under mouth and wrinkled at neck when dry.
Setae: Straight to somewhat flexuose, smooth, not or little twisted when dry, light brown to reddish brown.
Annuli: 2–3 rows of deciduous cells.
Opercula: Conic, straight.
Peristomes: Double, 16 exostome teeth, lanceolate, yellowish brown to orange, endostome segments linear-lanceolate, hyaline to yellow, 1–3 cilia, nodulose.
Spores: Green to brownish green, globose to ovoid, finely papillose, 12–17 μm in longest dimension.

1. **Heterocladium dimorphum** (Brid.) B.S.G., Bryol. Eur. 5: 153. 679. 1852 (fasc. 49–51 Mon. 3.1).
Hypnum dimorphum Brid., Spec. Musc. 2: 149. 1812.
[Synonym: *H. squarrosulum* Lindb.]
PLATE 262

Plants creeping, subpinnately branched, leaves dimorphous, stem leaves abruptly narrowed to a recurved acumen from a cordate-ovate base, branch leaves oblong-ovate to ovate, acute to obtuse at apex, costae indistinct, short and double, leaf cells prorate on dorsal surface, rarely producing sporophytes.

Habitat: On soil banks, bases of trees, sandstone boulders and rocks in moist woods.
Maritime Distribution: Common. New Brunswick (Charlotte, Queen's, Restigouche, York); Nova Scotia (Annapolis, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria); Prince Edward Island (Kings, Queens).
Range: Labrador to Ontario, south to *New York and Michigan; also from Alberta to Yukon Territory, south to Montana and Oregon. Iceland, *South America, Europe.
Chromosome Number: Unreported.

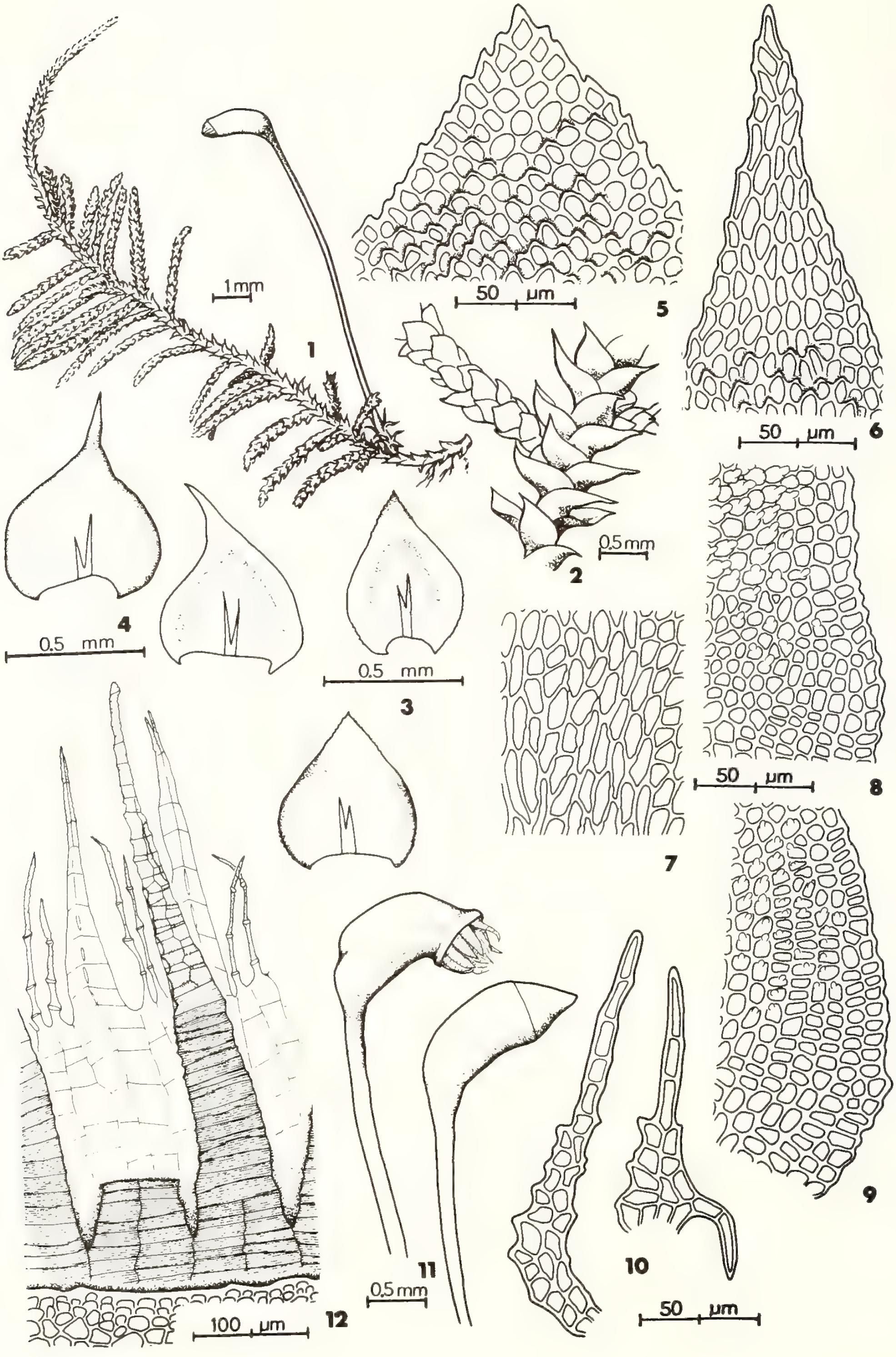
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Plate 262. *Heterocladium dimorphum*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–9. Leaf cells (5, apical of branch leaf. 6, apical of stem leaf. 7, median of branch leaf. 8, median-marginal of branch leaf. 9, alar of branch leaf.). 10. Paraphyllia. 11. Capsules, operculate (wet), inoperculate (dry). 12. Peristome teeth.

3. **Haplocladium** (C. Müll.) C. Müll., Nuov. Giorn. Bot. Ital. n. ser. 3: 116. 1896.

Hypnum subsect. *Haplocladium* C. Müll., Linnaea 42: 459. 1879.

Habit: In prostrate, loose mats.

Colour: Light green, yellowish green or brown, dull.

Stems: 1–5 cm long, creeping, subpinnately to pinnately branched, rhizoids papillose, in clusters just below juncture of leaves, primarily on ventral surface of stems. Paraphyllia on stems and branches, simple or branched, filamentous or foliose, cells unipapillose.

Leaves: Stem leaves erect-spreading, sometimes incurved when dry, concave, ovate to ovate-lanceolate, often biplicate, gradually long-acuminate to abruptly short-acuminate, nondecurrent, branch leaves smaller, erect to erect-spreading, little changed when dry, concave, ovate to ovate-lanceolate, acute to short-acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, long-acuminate.

Leaf Margins: Stem leaves plane above, revolute below, entire to irregularly serrate, branch leaves plane, entire to serrate.

Costae: Single, subpercurrent, prominent on dorsal surface.

Leaf Cells: Unipapillose, the walls thick, lacking pits. Median cells round, quadrate, hexagonal or oblong, becoming longer near apex and base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong to oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to flexuose, smooth, not or little twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic and apiculate to short-rostrate, straight to slightly arcuate.

Peristomes: Double, 16 exostome teeth, lanceolate, yellow to yellowish brown, endostome segments lanceolate, yellow, 2–4 cilia, nodulose to appendiculate.

Spores: Green to yellow, globose to ovoid, smooth to minutely papillose, 8–14 μm in longest dimension.

1. Stem leaves gradually long-acuminate; leaf margins entire to crenulate-serrate .... 1. *H. microphyllum*
1. Stem leaves abruptly short-acuminate; leaf margins irregularly serrate .... 2. *H. virginianum*

1. Haplocladium microphyllum (Hedw.) Broth., Nat. Pfl. 1(3): 1007. 1907.
Hypnum microphyllum Hedw., Spec. Musc. 269. 1801.
[Synonym: *Thuidium microphyllum* (Hedw.) Jaeg. & Sauerb.]
PLATE 263

Autoicous plants with pinnately branched stems, filamentous or foliose paraphyllia, gradually long-acuminate stem leaves with entire to crenulate margins, branch leaves ending in a unipapillose cell and with subpercurrent costae.

Habitat: On base of ash in mixed coniferous-deciduous woods.

Maritime Distribution: Rare. New Brunswick (County unknown); Nova Scotia (Annapolis).

Range: *Newfoundland to *British Columbia (?), south to Florida, Louisiana, Texas, and Arizona. Mexico, *Central and *South America, West Indies, Europe, Asia.

Chromosome Number: n = 10, 11.

2. Haplocladium virginianum (Brid.) Broth., Nat. Pfl. 1(3): 1007. 1907.
Hypnum virginianum Brid., Bryol. Univ. 2: 576. 1827.
[Synonym: *Thuidium virginianum* (Brid.) Schimp.]
PLATE 264

Very similar to *H. microphyllum* but the stem leaves are abruptly acute to acuminate and the margins are irregularly serrate.

Habitat: On sandy bank.

Maritime Distribution: Rare. Nova Scotia (Kings). Collected on Kentville Road, 18 November 1948 (*Erskine C810* CANM).

Range: Nova Scotia to Alberta, south to North Carolina, Kentucky, Arkansas, and Nebraska. *Central America, Europe, Asia.

Chromosome Number: n = 11.

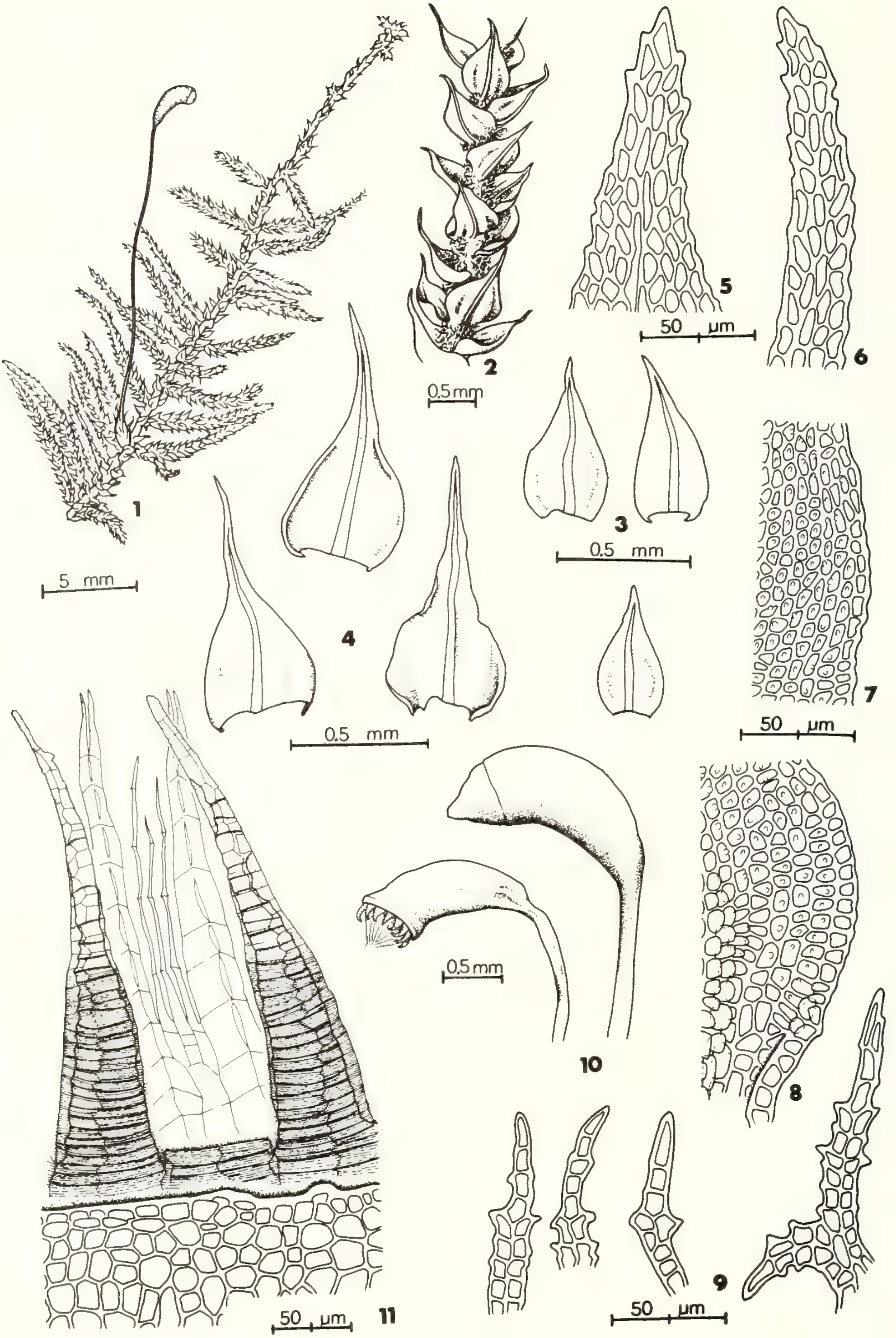
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Plate 263. *Haplocladium microphyllum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5. Apical cells of branch leaf. 6–8. Cells of stem leaf (6, apical. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome teeth.

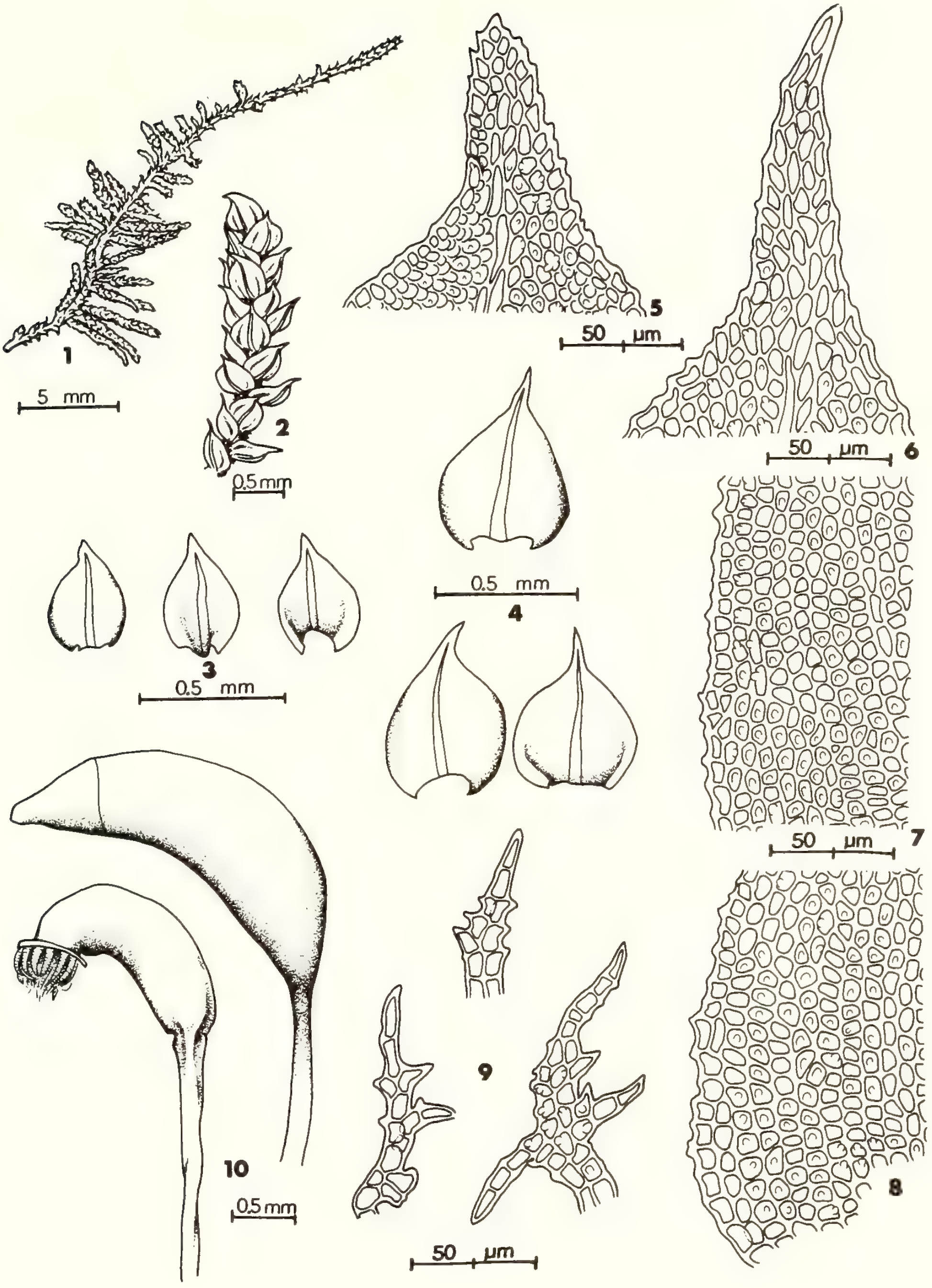
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Plate 264. *Haplocladium virginianum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5. Apical cells of branch leaf. 6–8. Cells of stem leaf (6, apical. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

4. **Thuidium** B.S.G., Bryol. Eur. 5: 157. 1852 (fasc. 49–51 Mon. 1).
[Synonyms: *Abietinella* C. Müll.; *Rauiella* Reim.]

Habit: In prostrate or ascending, loose mats.

Colour: Green to yellowish green, often brown near base, dull.

Stems: 2–10 cm long, creeping or ascending, 1–3 pinnately branched, often frondose, rhizoids smooth or papillose (*T. minutulum*), in clusters just below juncture of leaves or between leaves, primarily on the ventral surface of stems. Paraphyllia on stems and branches, simple or branched, filamentous or lanceolate, papillose.

Leaves: Stem leaves erect to squarrose, scarcely changed when dry, somewhat concave, ovate to subcordate, acuminate, nondecurrent or shortly decurrent, branch leaves considerably differentiated, erect, sometimes incurved-catenulate when dry, concave, ovate, acute to obtuse, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate to ovate-lanceolate, long-acuminate, sometimes ciliate on margins.

Leaf Margins: Stem leaves with margins often revolute below and sometimes above leaf middle, serrulate to serrate, branch leaves with margins plane, entire to serrate.

Costae: Single, subpercurrent to percurrent, prominent on dorsal surface.

Leaf Cells: Uni- to multipapillose, the walls thick, lacking pits. Median cells round to oblong, becoming longer near apex and base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong- to ovoid-cylindric, arcuate, inclined to horizontal, smooth, sometimes slightly contracted under mouth and wrinkled at neck when dry.

Setae: Straight to flexuose, smooth, not or little twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of small cells, deciduous.

Opercula: Conic to rostrate, straight to slightly arcuate.

Peristomes: Double, 16 exostome teeth, lanceolate, yellow to brown, endostome segments linear-lanceolate, yellow to orange, 1–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 9–24 μm in longest dimension.

1. Plants small, mostly less than 3 cm long and 1 cm wide; leaf cells multipapillose; autoicous ... 2
    2. Branch leaves incurved-catenulate when dry; paraphyllia simple .... 1. *T. minutulum*
    2. Branch leaves imbricate when dry; paraphyllia often branched .... 2. *T. scitum*
1. Plants large, mostly over 3 cm long and 1 cm wide; leaf cells unipapillose; dioicous 3
    3. Plants 1-pinnate .... 5. *T. abietinum*
    3. Plants 2–3 pinnate 4
        4. Stem leaves arched and standing out from stem when dry; papillae on paraphyllia at ends of cells .... 3. *T. recognitum*
        4. Stem leaves appressed to slightly spreading when dry; papillae on paraphyllia near the middle of the cells 5
            5. Stem leaves acute to acuminate, rarely filiform-acuminate; inner perichaetial leaves with long cilia .... 4. *T. delicatulum*
            5. Stem leaves with a hyaline, filiform-acumination, composed of 3–8 cells; inner perichaetial leaves without cilia or with only a few short ones .... 4a. *T. delicatulum* var. *radicans*

1. Thuidium minutulum (Hedw.) B.S.G., Bryol. Eur. 5: 161. 481. 1852 (fasc. 49–51 Mon. 5.1).
Hypnum minutulum Hedw., Spec. Musc. 260. 1801.
PLATE 265

The smallest member of the genus in the Maritimes. Plants autoicous, stems 1-pinnate, with simple paraphyllia, multipapillose leaf cells and branches with incurved-catenulate leaves when dry.

Habitat: Not reported for Maritime collection but known elsewhere on decayed wood, exposed roots, bases of trees, rocks and soil in moist woods.

Maritime Distribution: Rare. New Brunswick (Queen's). Collected at Hunter's Home, September 1898 (*Moser* NY).

Range: *Nova Scotia to Ontario, south to Florida and Louisiana. West Indies, Central and South America, Europe, *Asia, *Africa.

Chromosome Number: n = 11.

Remarks: *Thuidium pygmaeum* B.S.G., which is somewhat similar to *T. minutulum* but even smaller, may eventually be discovered in the Maritimes. It is a calciphile, occurring on rock, and it is known elsewhere in Canada in southern Ontario and Quebec. It differs from *T. minutulum* primarily by its papillose stems and branches.

The New Brunswick collection was not fruiting so Ontario plants were used for the sporophyte illustrations.

2. Thuidium scitum (P. Beauv.) Aust., Musci Appal. n. 300. 1870.
Hypnum scitum P. Beauv., Prodr. 69. 1805.
[Synonym: *Rauiella scita* (P. Beauv.) Reim.]
PLATE 266

Somewhat similar to *T. minutulum* because of its autoicous condition and multipapillose leaf cells but the plants are somewhat larger, possess branched paraphyllia and the branch leaves are imbricate when dry.

Habitat: On logs.

Maritime Distribution: Rare. New Brunswick (York). Collected in Fredericton, 8 October 1879 (*Fowler*, CANM 168954).

Range: New Brunswick to Ontario, south to North Carolina and Michigan; also in *Nova Scotia (?) and *Manitoba (?). *West Indies, *Europe, *Asia.

Chromosome Number: n = 11.

3. Thuidium recognitum (Hedw.) Lindb., Not. Saellsk. F. Fl. Fenn. Foerh. 13: 416. 1874.
Hypnum recognitum Hedw., Spec. Musc. 261. 1801.
PLATE 267

Similar to *T. delicatulum* but differing in the paraphyllia that have the papillae near the upper ends of the cells, stem leaves that are arched, standing out from the stem, especially at the base and high-conic opercula. Unlike *T. delicatulum*, this species prefers calcareous conditions.

Habitat: On calcareous soil, humus, boulders and sometimes on bases of trees in woods.

Maritime Distribution: Common. New Brunswick (Kent, Madawaska, Queen's, Restigouche, Victoria); Nova Scotia (Annapolis, Colchester, Hants, Inverness, Kings, Victoria); Prince Edward Island (Prince, Queens).

Range: Labrador to Alaska, south to Georgia, Tennessee, Arkansas, Oklahoma, Montana, and British Columbia. *Central and *South America, Europe, *Asia, *Africa, *Pacific Islands.

Chromosome Number: n = 11.

Remarks: Very similar to *T. delicatulum*.

4. Thuidium delicatulum (Hedw.) B.S.G., Bryol. Eur. 5: 164. 484. 1852 (fasc. 49–51 Mon. 8.4).
Hypnum delicatulum Hedw., Spec. Musc. 260. 1801.
PLATE 268

Plants dioicous, large, stems 3–10 cm long, frondose, 2–3 pinnate, paraphyllia branched, the cells papillose near the middle of the cells, stem leaves appressed to the stem or only slightly spreading, leaf cells unipapillose and opercula rostrate.

Habitat: On humus, soil, boulders, rotten logs and stumps in woods, generally in wet places.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Labrador to Alaska, south to Florida, Alabama, Louisiana, and Texas; also in Arizona. Iceland, Mexico, *West Indies, Central and South America, Europe, Asia, *Pacific Islands.

Chromosome Number: n = 11.

Remarks: Often confused with *T. recognitum* with which it should be compared. The frondose habit of the plants accounts for *T. delicatulum* being referred to as the "Fern Moss".

Thuidium tamariscinum (Hedw.) B.S.G. has been reported for New Brunswick (see Excluded Taxa). It seems to be a weak segregate of *T. delicatulum*, differing mainly by its larger size and the more common occurrence of 3-pinnate stems.

4. **Thuidium delicatulum** var. **radicans** (Kindb.) Crum, Steere, & Anders., Bryologist 68(4): 434. 1966.
Thuidium recognitum var. *radicans* Kindb., Rev. Bryol. 19: 103. 1892.
[Synonym: *T. philibertii* Limpr.]
PLATE 268

Differing from the var. *delicatulum* by the long, filiform acumination of the stem leaves and the inner perichaetial leaves that lack cilia or have only a few short ones.

Habitat: On humus, often in gorges.

Maritime Distribution: Rare. New Brunswick (Queen's, Victoria).

Range: Newfoundland to Alaska, south to Virginia, Michigan, Iowa, South Dakota, and British Columbia. Mexico, Central and *South America, Europe, Asia.

Chromosome Number: n = 11.

Remarks: An indistinct variety scarcely worth recognition.

5. **Thuidium abietinum** (Hedw.) B.S.G., Bryol. Eur. 5: 165. 485. 1852 (fasc. 49–51 Mon. 9.5).
Hypnum abietinum Hedw., Spec. Musc. 353. 1801.
[Synonym: *Abietinella abietina* (Hedw.) Fleisch.]
PLATE 269

Large, rigid, wiry, dioicous plants with unipapillose leaf cells and 1-pinnate stems.

Habitat: Preferring xerophytic habitats, primarily on calcareous rocks and cliff shelves, humus on slopes, and rotten stumps.

Maritime Distribution: Frequent. New Brunswick (Carleton, Charlotte, Restigouche, Victoria); Nova Scotia (Colchester, Cumberland, Guysborough, Hants, Victoria).

Range: Greenland to Alaska, south to Virginia, *Indiana, *Iowa, South Dakota, Colorado, and Arizona. Europe, Asia.

Chromosome Number: n = 11.

Remarks: The species rarely produces sporophytes and all of the Maritime collections seen were without them. Illustrations of capsules from western North American plants.

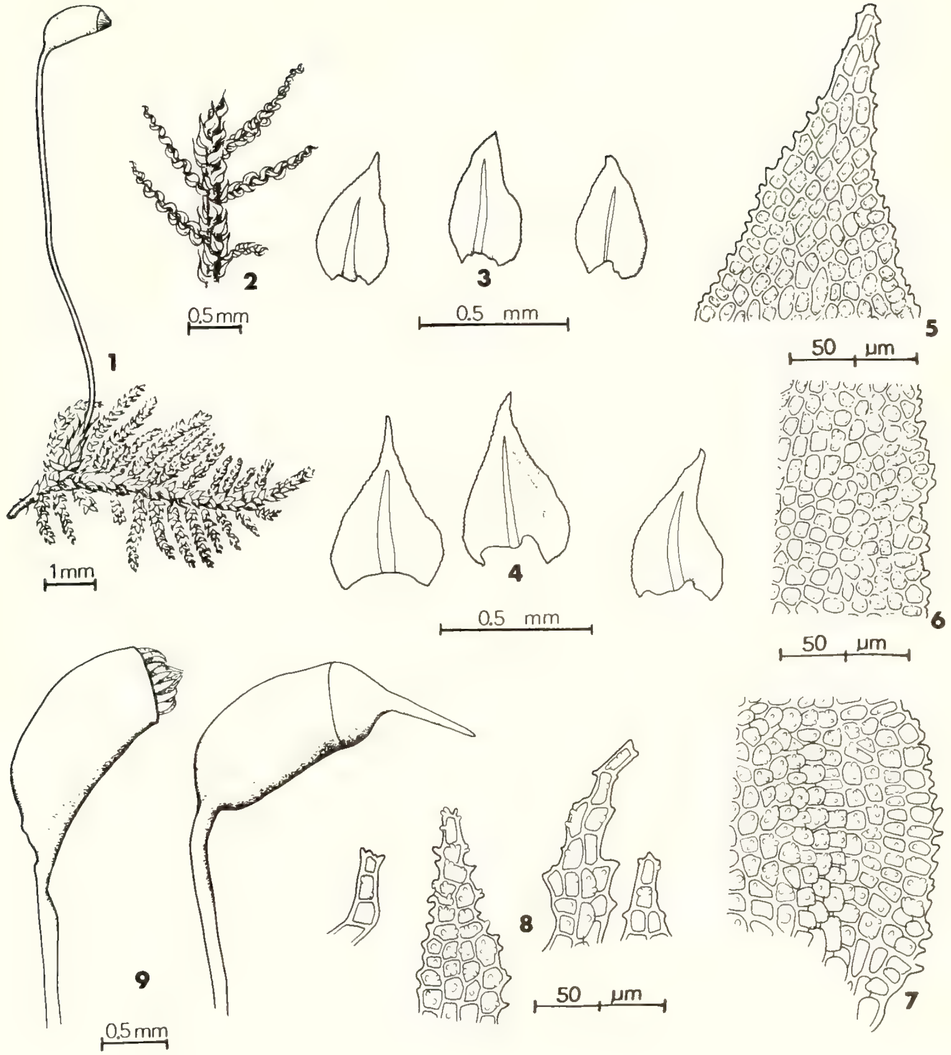
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Plate 265. *Thuidium minutulum*. 1. Habit. 2. Portion of stem (dry) showing incurved-catenulate branch leaves. 3. Branch leaves. 4. Stem leaves. 5–7. Cells of stem leaf (5, apical. 6, median-marginal. 7, alar.). 8. Paraphyllia. 9. Capsules, operculate (wet), inoperculate (dry).

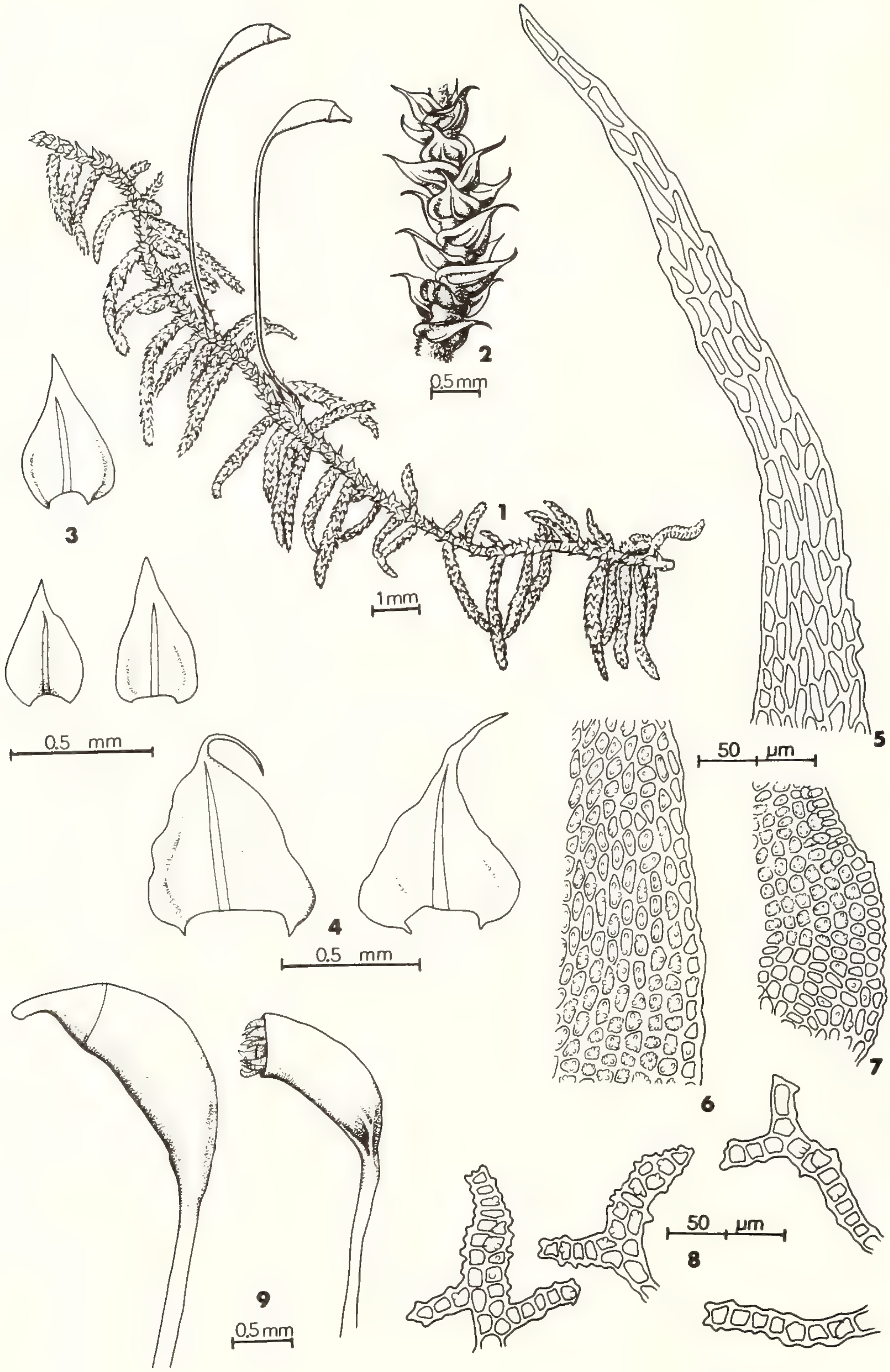
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Plate 266. *Thuidium scitum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5–7. Cells of stem leaf (5, apical. 6, median-marginal. 7, alar.). 8. Paraphyllia. 9. Capsules, operculate (wet), inoperculate (dry).

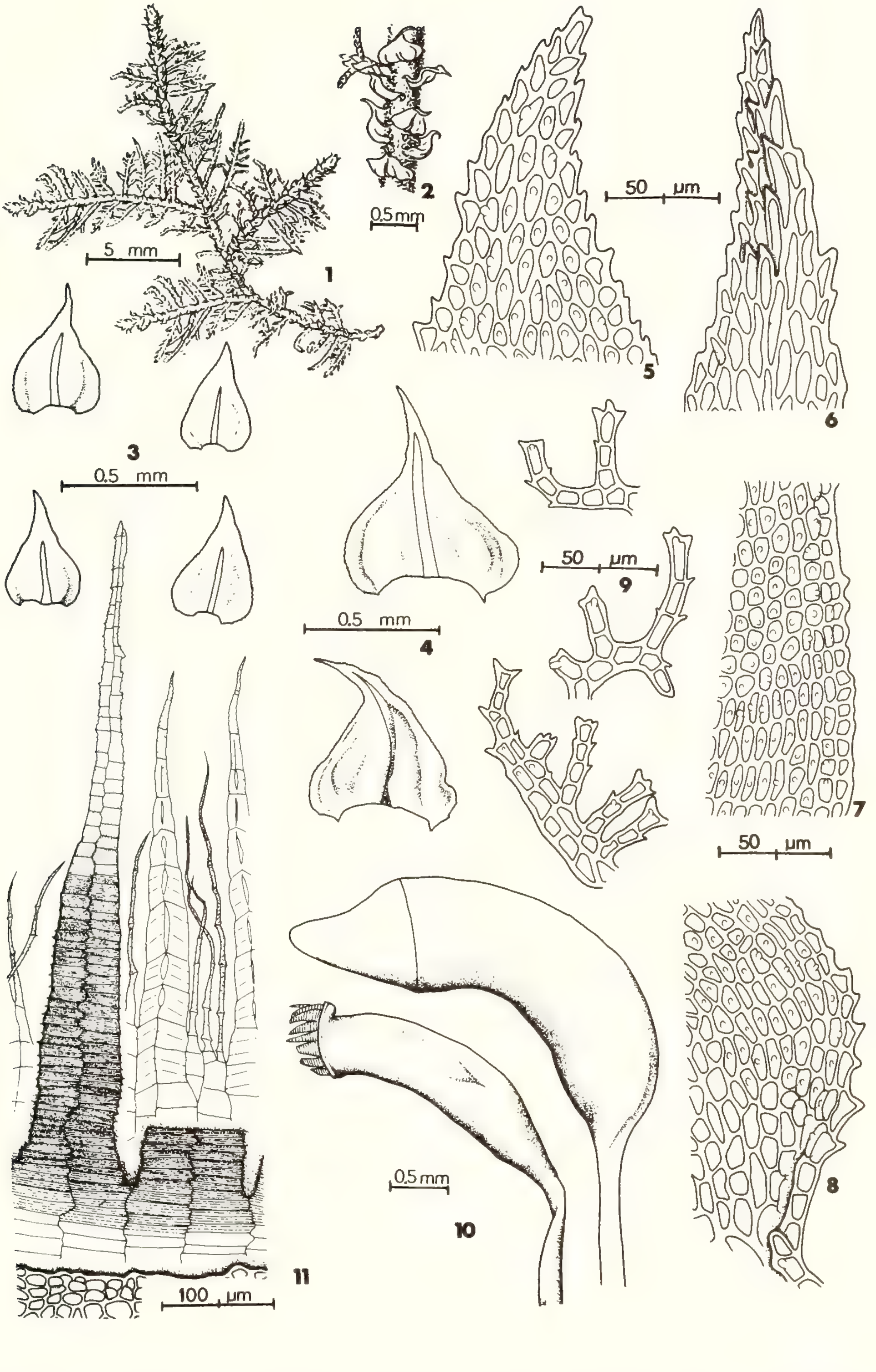
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Plate 267. *Thuidium recognitum*. 1. Habit. 2. Portion of stem showing recurved-spreading stem leaves. 3. Branch leaves. 4. Stem leaves. 5. Apical cells of branch leaf. 6–8. Cells of stem leaf (6, apical. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome teeth.

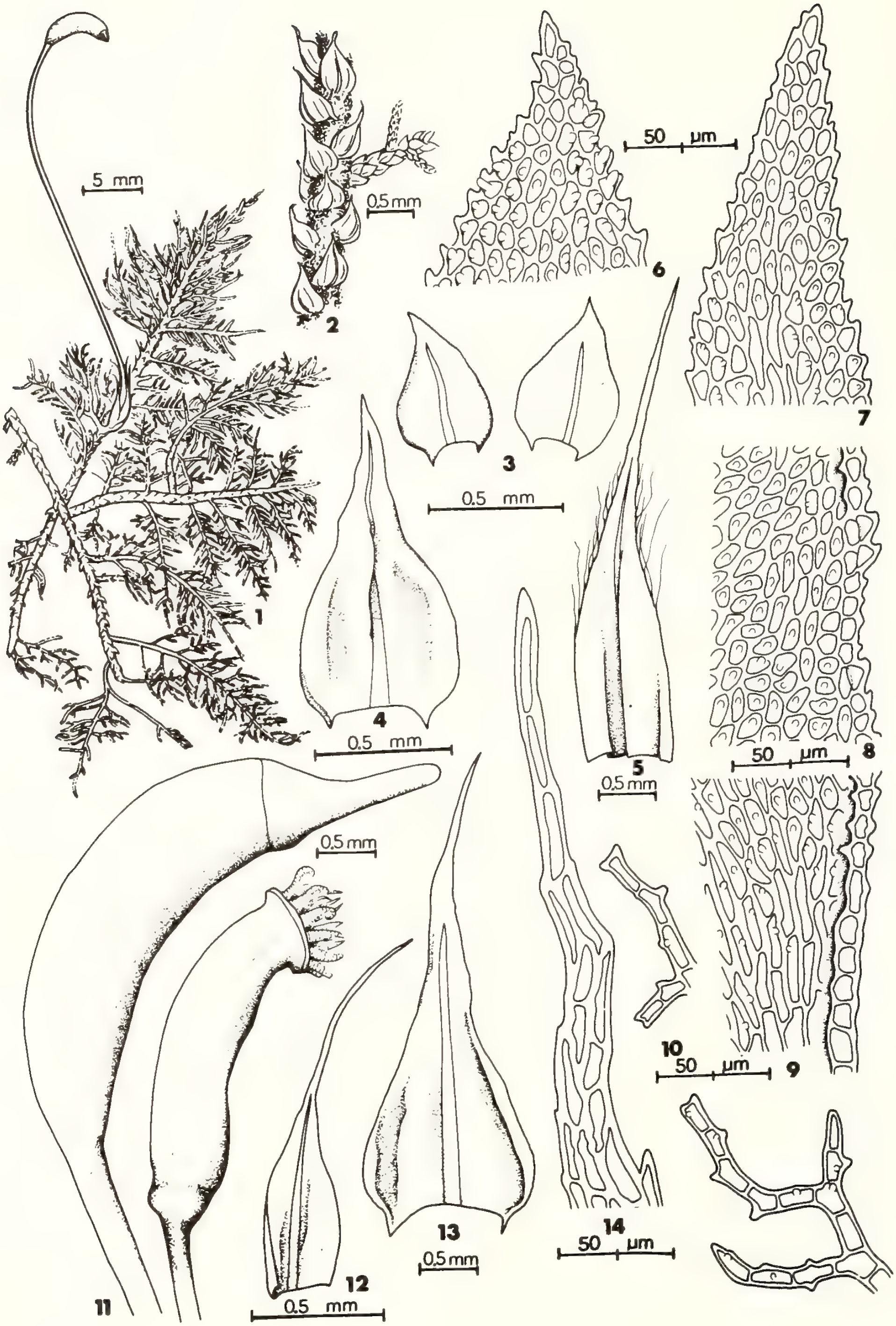
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Plate 268. 1–11. *Thuidium delicatulum*. 1. Habit. 2. Portion of stem showing appressed stem leaves. 3. Branch leaves. 4. Stem leaf. 5. Perichaetial leaf. 6. Apical cells of branch leaf. 7–9. Cells of stem leaf (7, apical. 8, median-marginal. 9, alar.). 10. Paraphyllia. 11. Capsules, operculate (wet), inoperculate (dry). 12–14. *Thuidium delicatulum* var. *radicans*. 12. Stem leaf. 13. Perichaetial leaf. 14. Apical cells of stem leaf.

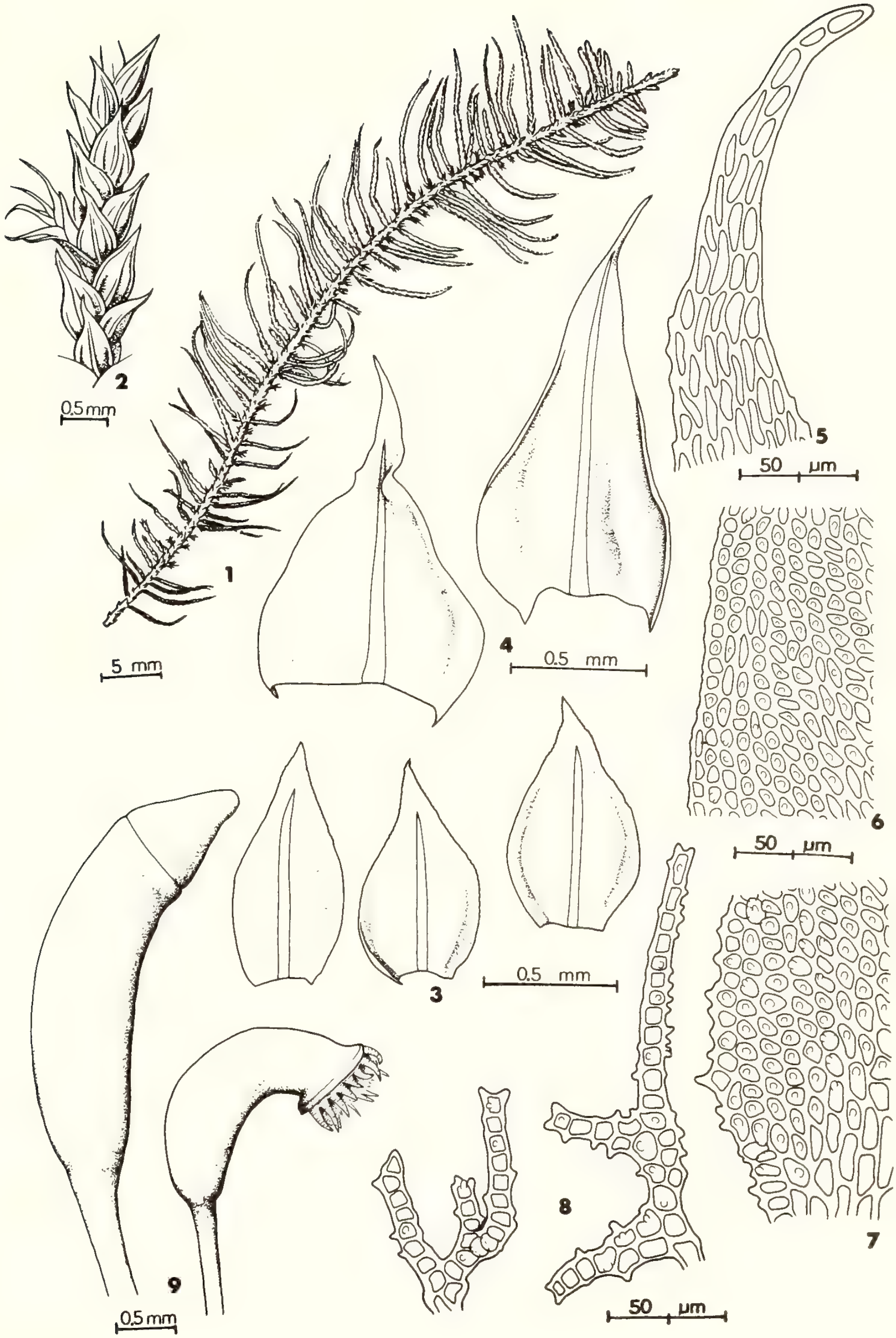
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Plate 269. *Thuidium abietinum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5–7. Cells of stem leaf (5, apical. 6, median-marginal. 7, alar.). 8. Paraphyllia. 9. Capsules, operculate (wet), inoperculate (dry).

5. **Helodium** (Sull.) Warnst., Krypt. Fl. Brandenburg 2: 675, 692. 1905. *nom. cons.*
Hypnum sect. *Elodium* Sull., Man. Bot. No. U.S. ed. 2: 668. 1856.

Habit: In ascending to erect, loose tufts.

Colour: Green to yellowish green, brown below, glossy, stems red to reddish brown.

Stems: 5–10 cm long, ascending to erect, pinnately branched, branches attenuate, rhizoids smooth or minutely papillose, scattered on stems between the leaves or at tips of branches. Paraphyllia abundant on stems, branches, basal leaf margins, and dorsal surface of costae at base of leaves, usually branched, filamentous, smooth, yellowish green to white, becoming brown with age.

Leaves: Stem and branch leaves similar except in size, erect to erect-spreading, twisted when dry, keeled, often plicate, ovate-lanceolate, short-acuminate, decurrent. Perichaetial leaves sheathing base of seta, ovate-lanceolate, long-acuminate.

Leaf Margins: Revolute nearly to apex, serrulate to serrate throughout, paraphyllia at base.

Costae: Single, about $^3/_4$ the leaf length, prominent on dorsal surface.

Leaf Cells: Prorate or strongly unipapillose on dorsal surface at upper end of cells, the walls thin to thick, pitted at base of leaves. Median cells fusiform or vermicular, becoming broad and rectangular at base.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary, on setae scattered along stems, light brown to orange, oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to flexuose, smooth, not or little twisted when dry, orange to red.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic, straight.

Peristomes: Double, 16 exostome teeth, lanceolate, yellow to yellowish brown, endostome segments lanceolate, hyaline to yellow, 1–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–15 μm in longest dimension.

1. **Helodium blandowii** (Web. & Mohr) Warnst., Krypt. Fl. Brandenburg 2: 692. 1905.
Hypnum blandowii Web. & Mohr, Bot. Taschenb. 332. 1807. [''blandovii'']
[Synonym: *Thuidium blandowii* (Web. & Mohr) B.S.G.]
PLATE 270

Plants ascending to erect, pinnately branched, appearing soft, green to yellowish green, with long, reddish stems, 5–10 cm in length, and stems, branches and base of leaves covered with long, filamentous paraphyllia.

Habitat: In bogs, swamps, near springs and in wet depressions in woods.

Maritime Distribution: Frequent. New Brunswick (Carleton, Charlotte, Queen's, Victoria); Nova Scotia (Cape Breton, Colchester, Halifax, Hants, Victoria); Prince Edward Island (Prince).

Range: Greenland to Alaska, south to New York, *Ohio, Michigan, Wisconsin, Minnesota, Colorado, Arizona, and Washington. Europe, *Asia.

Chromosome Number: n = 12.

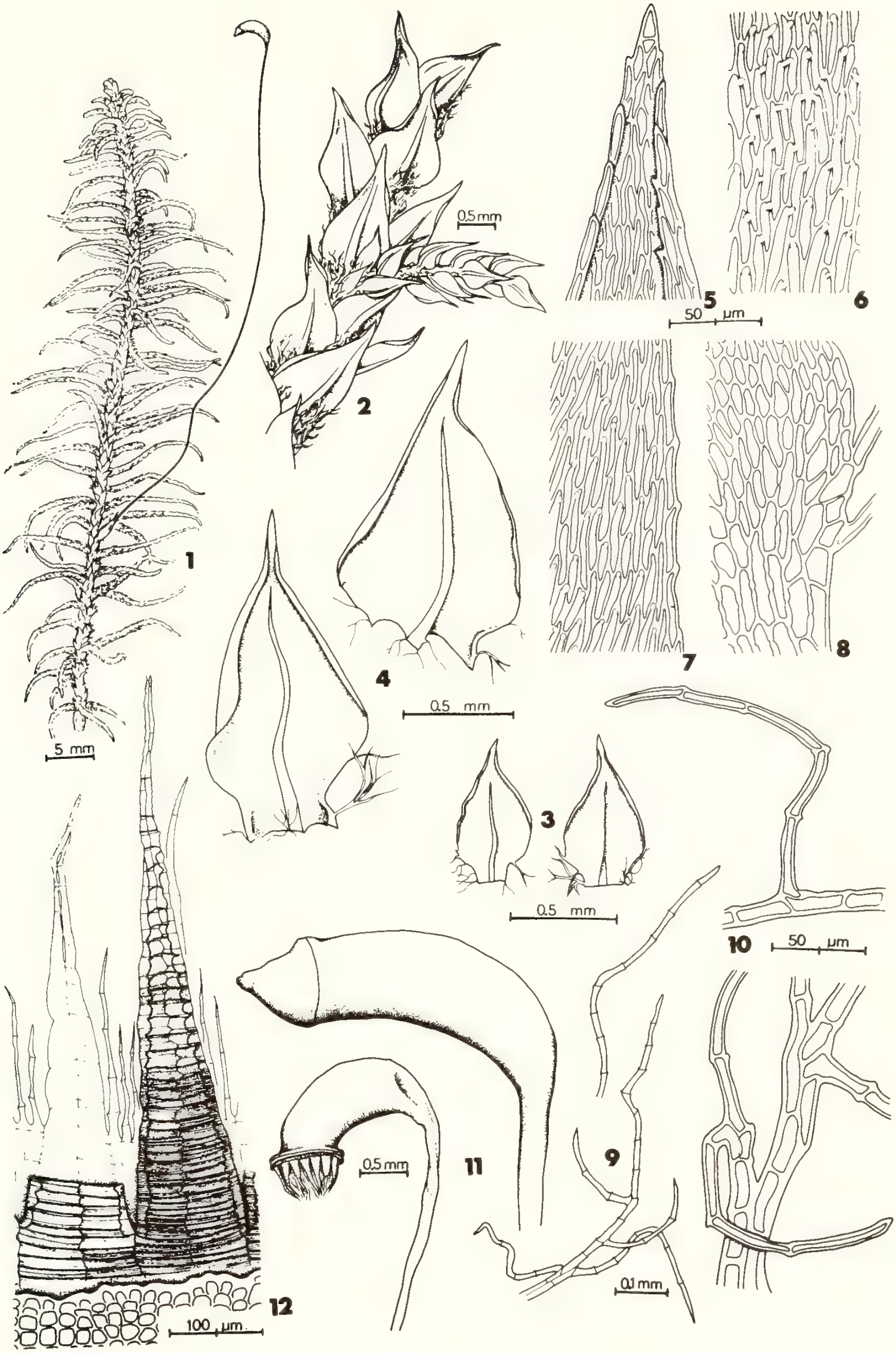
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Plate 270. *Helodium blandowii*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Enlargement of portion of paraphyllia. 11. Capsules, operculate (wet), inoperculate (dry). 12. Peristome teeth.

Family AMBLYSTEGIACEAE

1. Leaves ecostate or costae short and ending below middle of leaf 2
  2. Stems subpinnate to pinnate; stems and branches cuspidate at apices .... 12. *Calliergonella* (p. 533)
  2. Stems irregularly branched; stems and branches not cuspidate at apices 3
    3. Plants small, leaves mostly 0.5 mm or less long .... 5. *Platydictya* (p. 491)
    3. Plants larger, leaves usually more than 0.5 mm long 4
      4. Plants turgid, leaves imbricate, stems with epidermal cells large and thin-walled .... 10. *Scorpidium* (p. 526)
      4. Plants not turgid, leaves usually spreading or squarrose, stems with epidermal cells small and thick-walled 5
        5. Leaves narrowed to a channelled acumen .... 6. *Campylium* (in part) (p. 495)
        5. Leaves acute .... 9. *Hygrohypnum* (in part) (p. 517)
1. Leaves costate, the costae single or double and extending to leaf middle or above 6
  6. Leaf margins with differentiated border of linear cells .... 1. *Sciaromium* (p. 476)
  6. Leaf margins lacking differentiated border of linear cells 7
    7. Leaves broadly obtuse; alar cells enlarged or inflated .... 11. *Calliergon* (p. 528)
    7. Leaves acute to acuminate, rarely obtuse but if so, alar cells not greatly enlarged or inflated 8
      8. Paraphyllia present (sometimes few and difficult to find) .... 7. *Cratoneuron* (p. 504)
      8. Paraphyllia lacking but pseudoparaphyllia often present 9
        9. Leaves falcate, often falcate-secund, especially at stem and branch tips, acuminate; alar cells often enlarged and inflated .... 8. *Drepanocladus* (p. 508)
        9. Leaves not falcate-secund or if so, acute; alar cells rarely enlarged and inflated 10
          10. Leaves broad, the length seldom more than twice the width .... 9. *Hygrohypnum* (in part) (p. 517)
          10. Leaves narrower, usually much longer than 2:1 11
            11. Leaves spreading to squarrose, narrowed at the apex to a channelled acumen .... 6. *Campylium* (in part) (p. 495)
            11. Leaves erect to spreading, apex flat 12
              12. Costae subpercurrent to excurrent .... 2. *Hygroamblystegium* (p. 479)
              12. Costae ending near leaf middle or rarely subpercurrent 13
                13. Alar cells short, quadrate to short-rectangular .... 3. *Amblystegium* (p. 483)
                13. Alar cells long, rectangular .... 4. *Leptodictyum* (p. 487)

1. Sciaromium (Mitt.) Mitt., J. Linn. Soc. Bot. 12: 571. 1869.

Leskea sect. *Sciaromium* Mitt., J. Linn. Soc. Bot. 8: 7. 1864.
[Synonym: *Platylomella* Andrews]

Habit: Prostrate, in loose to dense mats.
Colour: Light green to brownish or blackish green, dull to glossy.
Stems: 1–3 cm long, creeping, irregularly to subpinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids papillose, in clusters between leaves near base of stems. Pseudoparaphyllia foliose, narrowly lanceolate.

Leaves: Stem and branch leaves similar, close to distant, erect to spreading, often twisted when dry, smooth, lamina usually bistratose on or near margins, lanceolate to ovate-lanceolate, acute to narrowly obtuse, nondecurrent to shortly decurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane, entire to serrulate throughout, with 3–5 rows of linear cells in 1–2 layers.

Costae: Single, percurrent, merging with marginal border cells at apex, prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick, lacking pits or a few present at leaf base. Median cells oblong or oblong-rhomboidal, often flexuose, linear on margins, alar cells scarcely differentiated.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, cylindric to oblong-cylindric, arcuate, horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of small cells, deciduous.

Opercula: Conic, usually apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 17–24 μm in longest dimension.

1. Sciaromium lescurii (Sull.) Broth., Nat. Pfl. 1(3): 1030. 1908.

Hypnum lescurii Sull., Man. Bot. No. U.S. ed 2: 679. 1856.

[Synonym: *Platylomella lescurii* (Sull.) Andrews]

PLATE 271

Plants resembling a *Hygroamblystegium* but differing in the leaf margins that are bordered by several rows of linear cells in 1–2 layers.

Habitat: On rocks and boulders in creeks and rivers.

Maritime Distribution: Frequent. New Brunswick (Charlotte); Nova Scotia (Halifax, Hants, Inverness, Lunenburg, Queens).

Range: Endemic to North America, from Newfoundland to Ontario, south to Georgia, Alabama, and Arkansas.

Chromosome Number: n = 11.

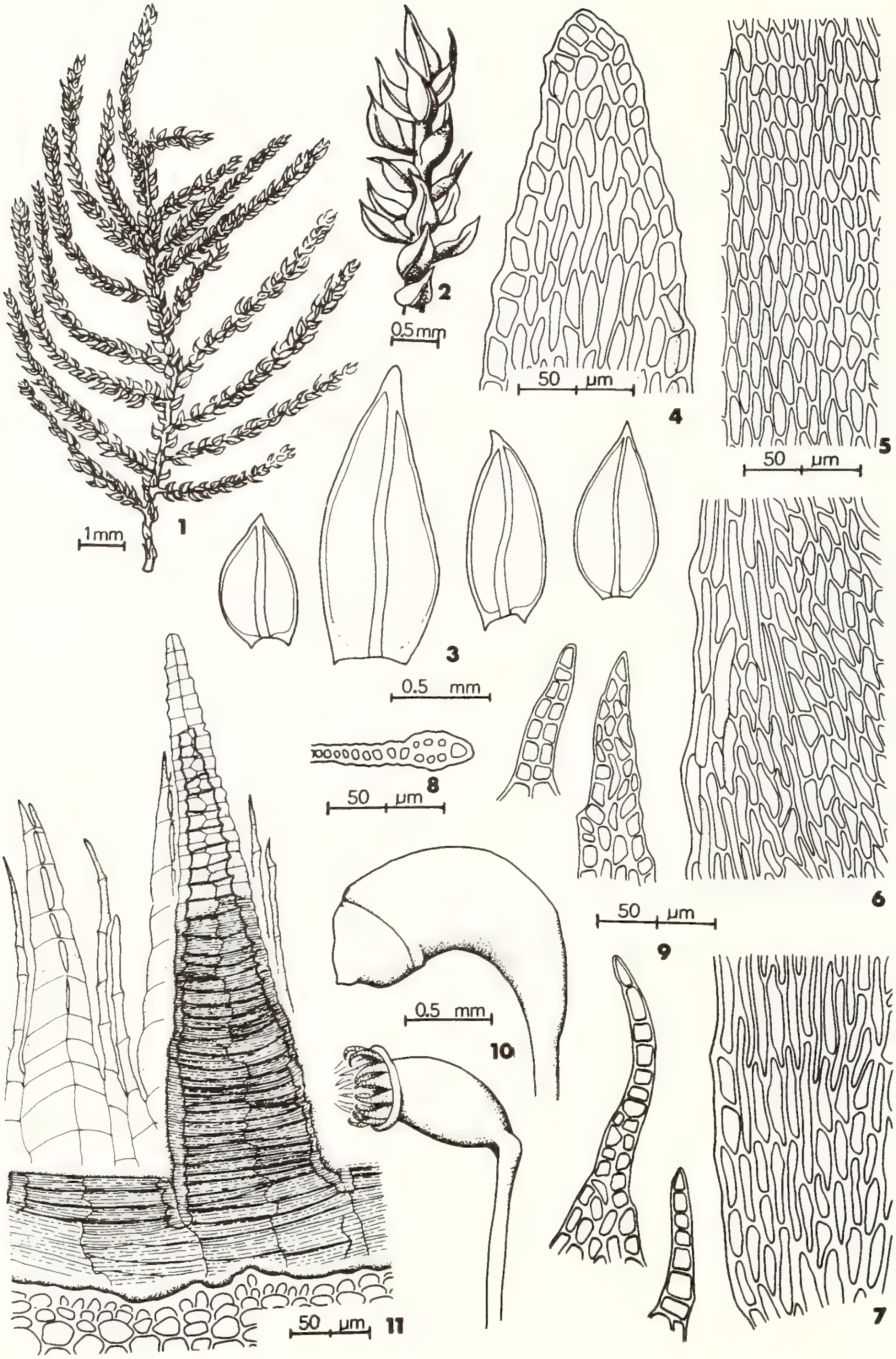
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Plate 271. *Sciaromium lescurii*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of leaf margin. 9. Pseudoparaphyllia. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome teeth.

2. **Hygroamblystegium** Loeske, Moosfl. Harz. 298. *nom. cons.*

Habit: Prostrate, in loose to dense mats.

Colour: Green to yellowish or brownish green, dull.

Stems: 1–5 cm long, creeping, irregularly branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth or papillose, in clusters just below juncture of leaves along stems. Pseudoparaphyllia foliose, lanceolate.

Leaves: Stem and branch leaves similar, close to distant, erect to spreading, often twisted when dry, smooth, lanceolate, ovate-lanceolate or oblong-lanceolate, acute to acuminate, sometimes narrowly obtuse, nondecurrent to shortly decurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane, entire, sometimes serrulate at apex.

Costae: Single, stout, subpercurrent to excurrent, prominent on dorsal surface, often appearing as a bristle when leaf laminae have eroded.

Leaf Cells: Smooth, the walls thick or of medium thickness, lacking pits. Median cells oblong, elliptic, or rhomboidal, alar cells somewhat differentiated, mostly rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, cylindric to oblong-cylindric, arcuate, horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of small cells, deciduous.

Opercula: Conic, apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 9–19 μm in longest dimension.

Hygroamblystegium is a weak segregate of *Amblystegium* from which it differs by its aquatic habit and stronger costa. Crum and Anderson (1981) include the genus in *Amblystegium*.

1. Leaves acute to obtuse, costae subpercurrent to percurrent .... 1. *H. fluviatile*
1. Leaves acuminate, costae excurrent in many leaves .... 2. *H. tenax*

1. **Hygroamblystegium fluviatile** (Hedw.) Loeske, Moosfl. Harz. 299. 1903.
Hypnum fluviatile Hedw., Spec. Musc. 277. 1801.
[Synonym: *Amblystegium fluviatile* (Hedw.) B.S.G.]
PLATE 272

Aquatic or semi-aquatic plants, stems to 5 cm long, irregularly branched, leaves lanceolate, ovate-lanceolate or oblong-lanceolate, acute to obtuse, 1–2 mm long, costae single, subpercurrent to percurrent, median cells oblong, elliptic or rhomboidal, alar cells often rectangular; autoicous, capsules cylindric to oblong-cylindric, arcuate, horizontal, 2–3 mm long.

Habitat: On rocks or rarely decayed wood in streams and brooks, sometimes on wet rock ledges.

Maritime Distribution: Frequent. New Brunswick (Albert, Carleton, Queen's, Restigouche, Victoria, York); Nova Scotia (Hants, Inverness, Kings, Pictou, Victoria).

Range: *Newfoundland to Manitoba, south to Georgia, Tennessee, Arkansas, and Kansas; also in Washington. *Central and *South America, Europe, *Asia, *Africa.

Chromosome Number: n = 20.

2. Hygroamblystegium tenax (Hedw.) Jenn., Man. Moss W. Pennsylv. 227. 1913.

Hypnum tenax Hedw., Spec. Musc. 277. 1801. [Synonyms: *Amblystegium irriguum* (Hook. & Wils.) B.S.G.; *A. tenax* (Hedw.) C. Jens.; *H. orthocladon* (P. Beauv.) Loeske; *H. irriguum* var. *spinifolium* (Schimp.) Mönk.]

PLATE 273

A species very similar to the preceding and differing only by the acuminate leaves with excurrent costae.

Habitat: On boulders, rock ledges and bluffs (often calcareous) in water, rarely on woody debris and soil over boulders.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, King's, Victoria, Westmorland); Nova Scotia (Annapolis, Colchester, Guysborough, Hants, Inverness, Kings, Victoria); Prince Edward Island (Kings, Queens).

Range: Newfoundland to British Columbia, south to Florida, Louisiana, Texas, Arizona, and California. Mexico, *South America, Europe, *Asia, *Africa.

Chromosome Number: n = 12, 20, 30.

Remarks: *Hygroamblystegium tenax* and *H. fluviatile* are extremely close morphologically and Crum's (1976) statement that the two are hardly worth segregating seems to apply to the Maritime plants.

See remarks under *Amblystegium varium* for possible confusion with that species.

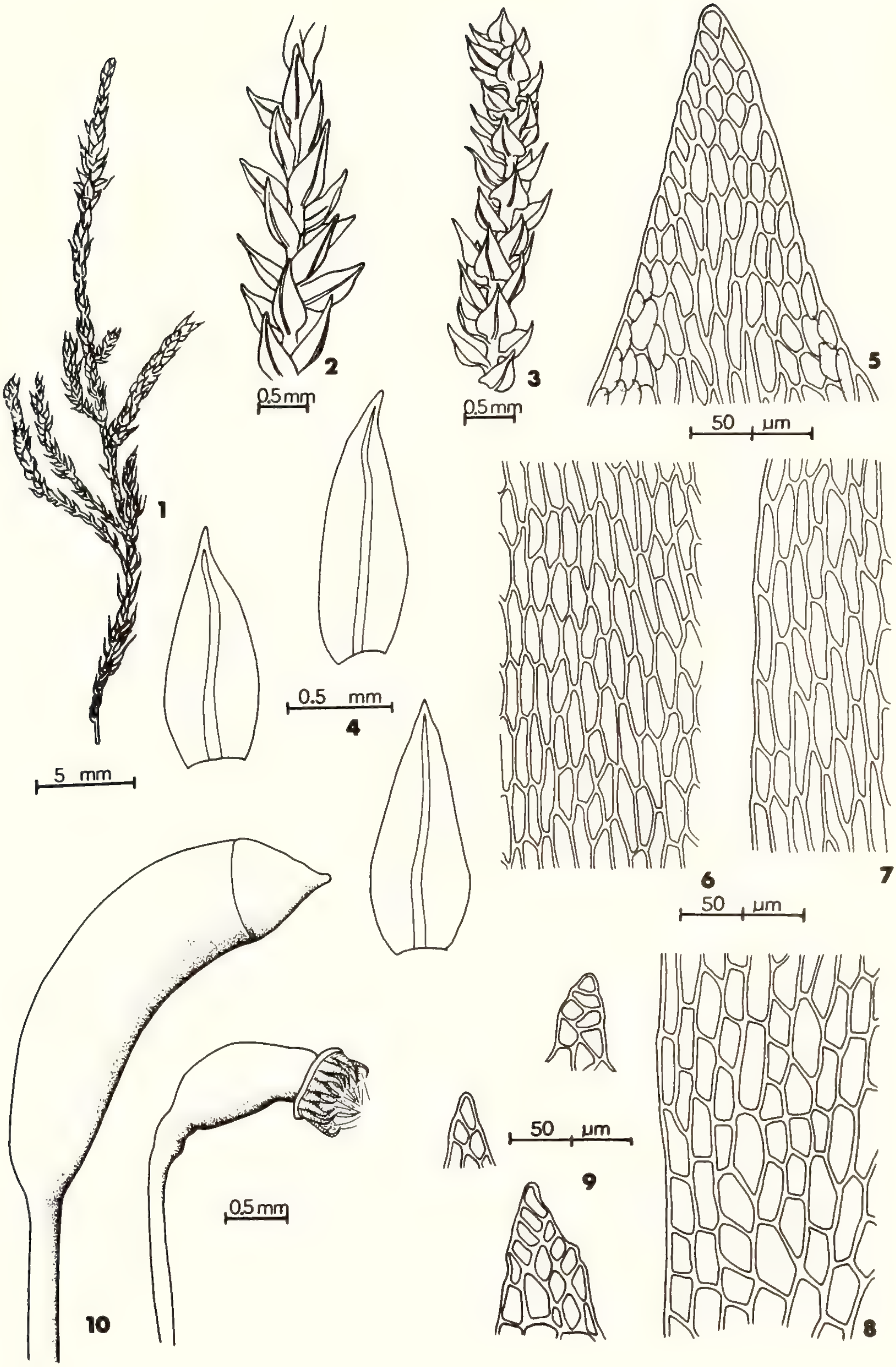
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Plate 272. *Hygroamblystegium fluviatile*. 1. Habit. 2–3. Portion of stems. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

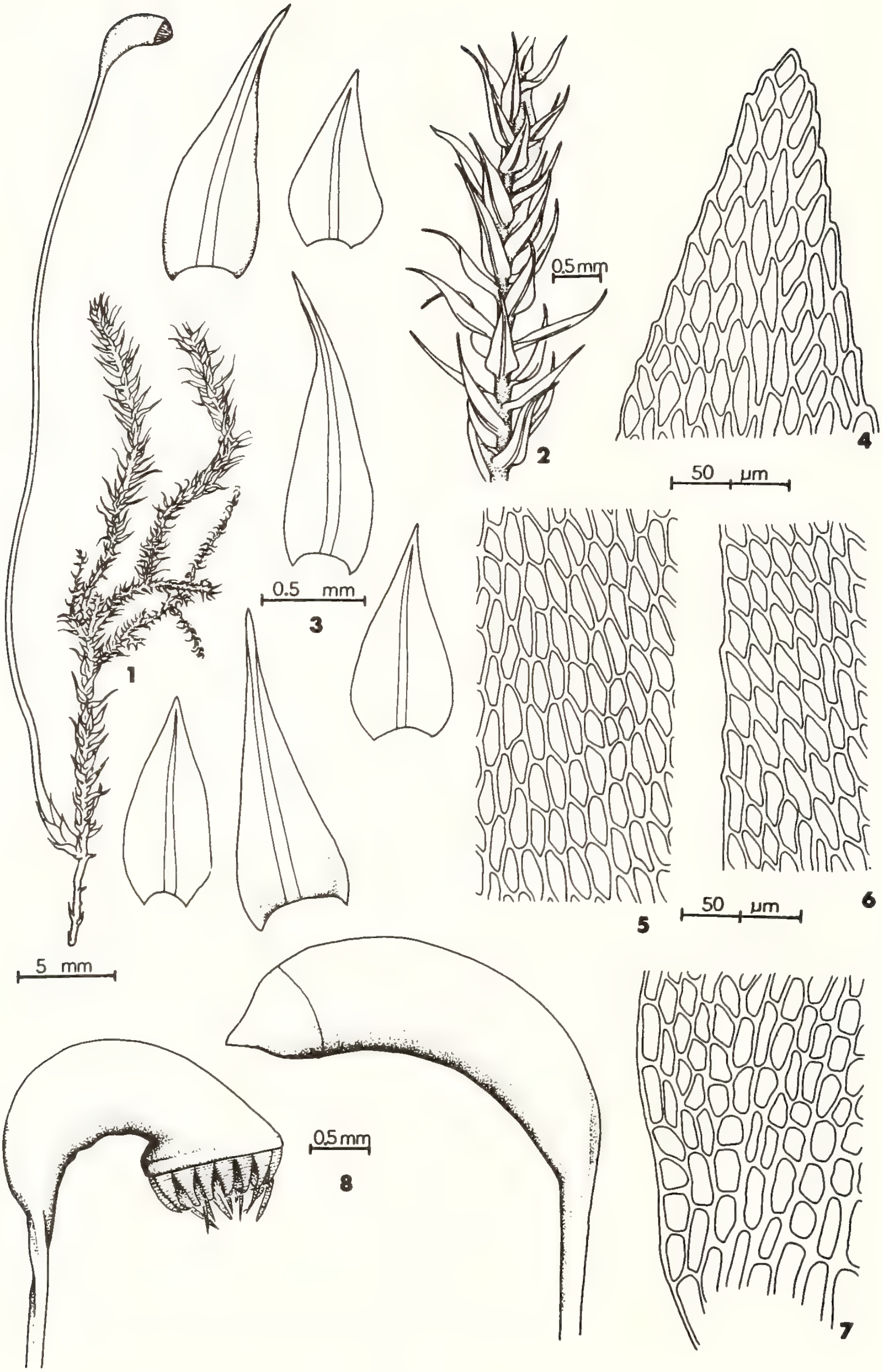
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Plate 273. *Hygroamblystegium tenax*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

3. **Amblystegium** B.S.G., Bryol. Eur. 6: 45. 1853 (fasc. 55–56 Mon. 1).

Habit: Prostrate, in loose to dense mats.
Colour: Green to yellowish or brownish green, dull.
Stems: 1–5 cm long, creeping, irregularly and often sparingly branched, epidermal cells small and thick-walled in cross-section, rhizoids papillose, in clusters just below juncture of leaves, primarily on ventral surface of stems. Pseudoparaphyllia foliose, lanceolate.
Leaves: Stem and branch leaves similar, close to distant, erect to wide-spreading, flat, often twisted when dry, smooth, lanceolate to ovate, acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate, 2–3 times as long as stem leaves.
Leaf Margins: Plane, entire to serrulate.
Costae: Single, ending near leaf middle or subpercurrent to percurrent, scarcely prominent on dorsal surface.
Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits or a few basal cells indistinctly pitted. Median cells oblong, elliptic, rhomboidal or oblong-hexagonal, becoming longer at apex and base, quadrate, rectangular or transversely rectangular on basal margins.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous.
Calyptrae: Cucullate, naked, yellowish with a reddish tip.
Capsules: Solitary, on setae scattered along stems, yellow, brown or reddish brown, cylindric to oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.
Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, yellow, brown or reddish brown.
Annuli: 2–3 rows of small cells, deciduous.
Opercula: Conic, apiculate, straight.
Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–3 cilia, nodulose.
Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 9–19 μm in longest dimension.

1. Costae subpercurrent to percurrent .... 1. *A. varium*
1. Costae ending near middle of leaves or somewhat above .... 2. *A. serpens*

1. Amblystegium varium (Hedw.) Lindb., Musci Scand. 32. 1879.
Leskea varia Hedw., Spec. Musc. 216. 1801.
PLATE 274

Easy to distinguish from the other *Amblystegium* species because of the strong subpercurrent to percurrent costae. There is a tendency for the median leaf cells to be shorter than *A. serpens* but this may be a variable feature.

Habitat: On base of trees, rotten wood and soil.
Maritime Distribution: Frequent. New Brunswick (Charlotte, York); Nova Scotia (Annapolis, Hants, Queens); Prince Edward Island (Queens).
Range: Labrador to *British Columbia, south to Florida, Louisiana, and Texas. Mexico, *Central and *South America, Europe, *Asia, *Africa.
Chromosome Number: n = 10, 11, 13, 20, 40.
Remarks: This species sometimes resembles *Hygroamblystegium tenax* but plants of *A. varium* are usually not as coarse, the leaves are smaller and the costae are not as stout.

2. **Amblystegium serpens** (Hedw.) B.S.G., Bryol. Eur. 6: 53. 564. 1853 (fasc. 55–56 Mon. 9.3). *Hypnum serpens* Hedw., Spec. Musc. 268. 1801. [Synonym: *Amblystegium juratzkanum* Schimp.]

PLATE 275

The weaker costae, ending near the middle of the leaves, will distinguish this species from *A. varium*.

Habitat: On base of trees, stumps, old logs, rocks and soil in woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Kent, Queen's, Restigouche, St. John, Victoria, Westmorland); Nova Scotia (Annapolis, Digby, Halifax, Hants, Kings, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to Florida, Louisiana, Texas, Arizona, and California. Mexico, *Central and South America, Europe, *Asia, *Africa, *New Zealand.

Chromosome Number: n = 7, 10, 11, 12, 13, 19, 20, 21.

Remarks: The marginal alar cells, which have been used to separate *A. juratzkanum* Schimp. from *A. serpens*, appear to be a variable feature, and since no other important differences could be found it was necessary to synonymize the species. Crum (1976) previously reached the same conclusion, however, Crum and Anderson (1981) continue to recognize it with "strong reservations" as *A. serpens* var. *juratzkanum* (Schimp.) Rau & Herv.

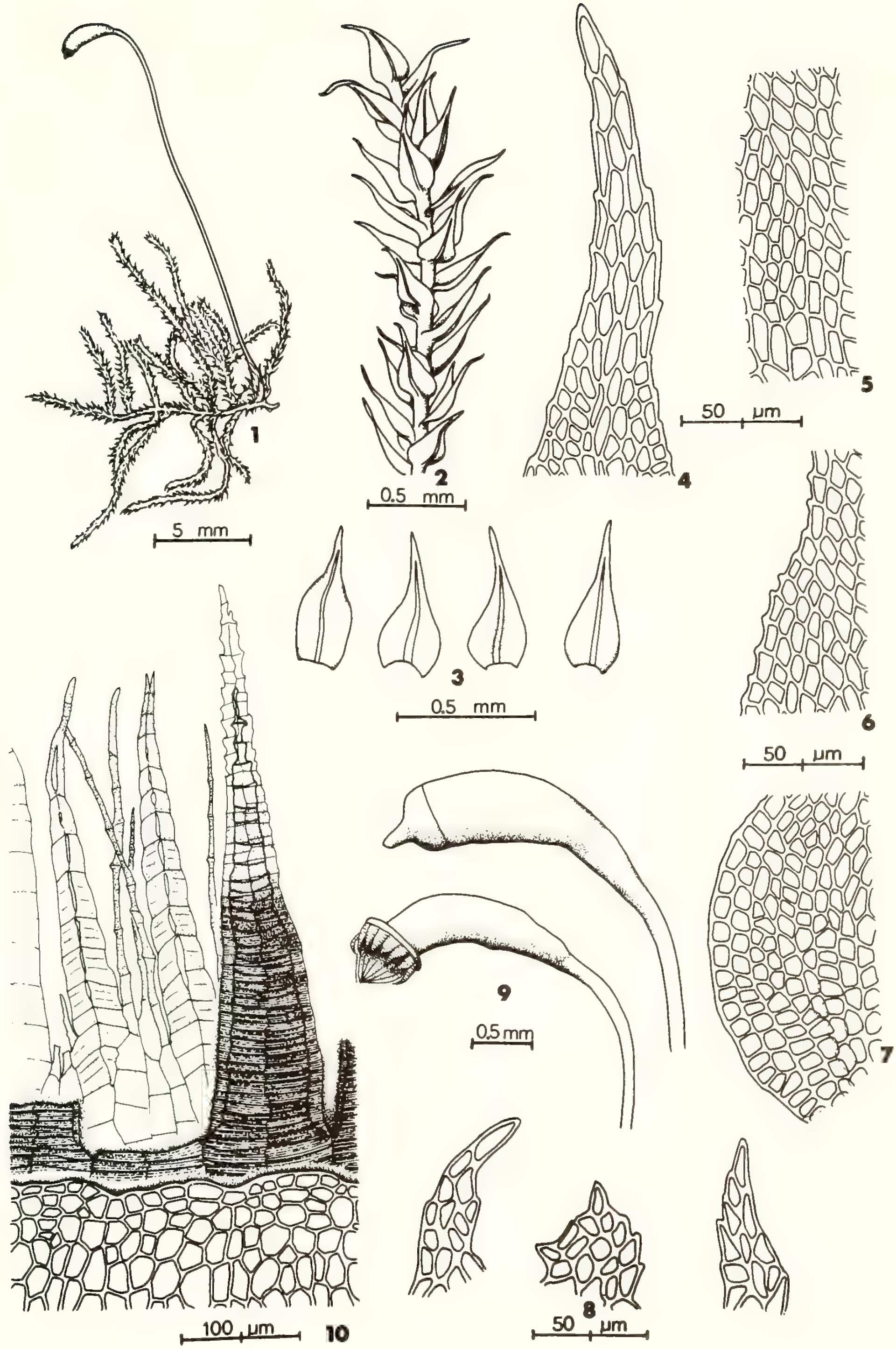
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Plate 274. *Amblystegium varium*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

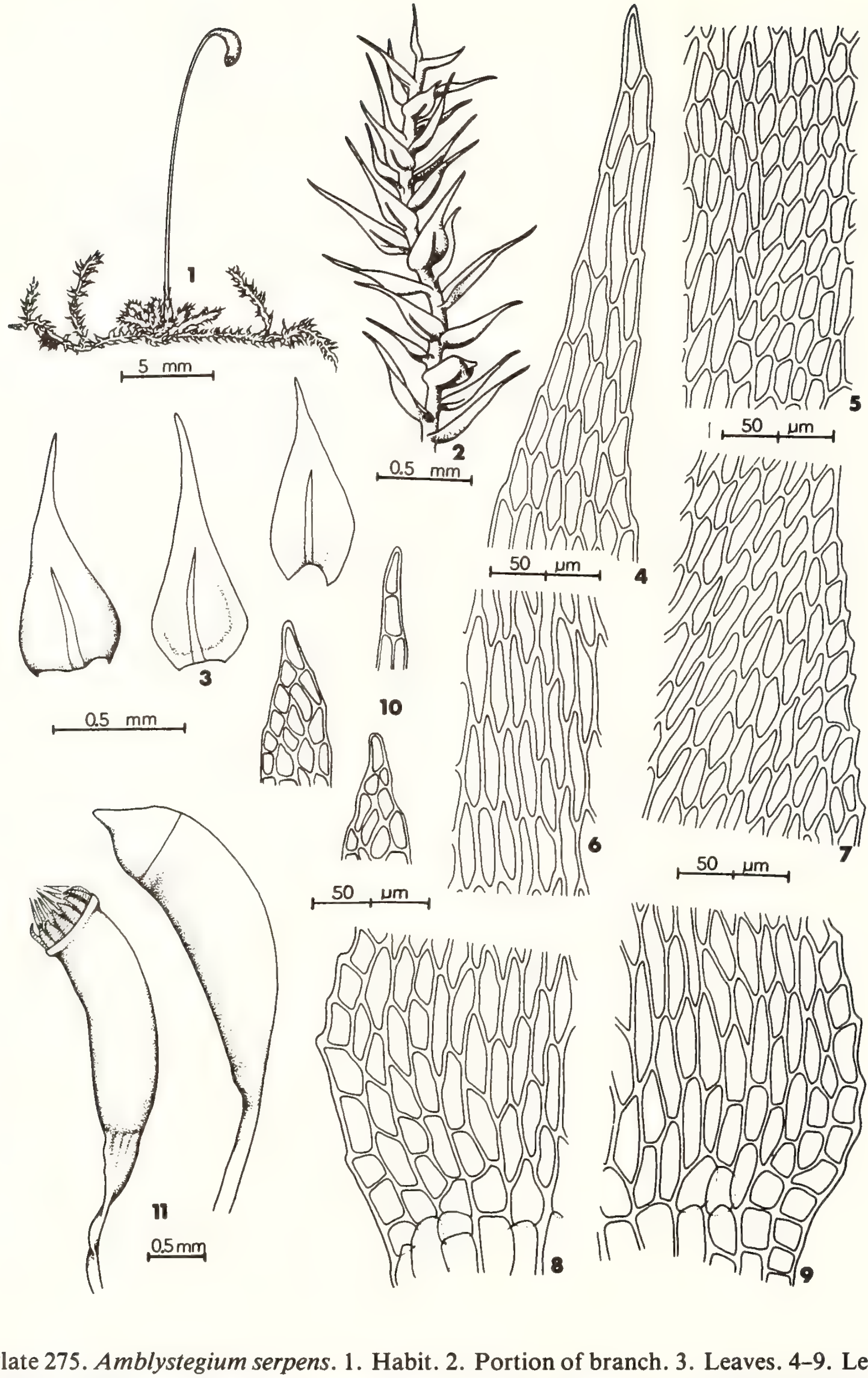
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Plate 275. *Amblystegium serpens*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–9. Leaf cells (4, apical. 5–6, median. 7, median-marginal. 8–9, alar.). 10. Pseudoparaphyllia. 11. Capsules, operculate (wet), inoperculate (dry).

4. **Leptodictyum** (Schimp.) Warnst., Krypt. Fl. Brandenburg 2: 840. 1906.

Amblystegium subg. *Leptodictyum* Schimp., Syn. 595. 1860.

Habit: Prostrate, in loose to dense mats.

Colour: Green to yellowish or brownish green, dull to glossy.

Stems: 1–10 cm long, creeping, irregularly branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth, sparse, in clusters just below juncture of leaves along stems. Pseudoparaphyllia foliose, lanceolate.

Leaves: Stem and branch leaves similar, close to distant, erect to wide-spreading, somewhat complanate, slightly contorted when dry, smooth, lanceolate to ovate, acuminate, nondecurrent, rhizoids sometimes on dorsal surface of costa near base. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane, entire or serrulate throughout.

Costae: Single, extending $^1/_2$–$^3/_4$ the leaf length.

Leaf Cells: Smooth, the walls thick or of medium thickness, lacking pits. Median cells linear, flexuose or rhomboidal, alar cells enlarged, rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of small cells, deciduous.

Opercula: Conic, apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–14 μm in longest dimension.

Leptodictyum is close to *Amblystegium* and Crum and Anderson (1981) include it in that genus.

1. Leaves short, 1–2 mm, with weakly serrulate margins, median cells 3–6:1 . . . 1. *L. trichopodium*
1. Leaves long, 2–5 mm, with entire margins, median cells 6–15:1 . . . . 2. *L. riparium*

1. Leptodictyum trichopodium (Schultz) Warnst., Krypt. Fl. Brandenburg 2: 881. 1906.
Hypnum trichopodium Schultz, Fl. Starg. 324. 1806.
[Synonyms: *Amblystegium kochii* B.S.G.; *Leptodictyum trichopodium* var. *kochii* (B.S.G.) Broth.]
PLATE 276

Plants irregularly branched, stems up to 4 cm long, leaves straight, wide-spreading, usually somewhat complanate, ovate to ovate-lanceolate, acuminate, 1–2 mm long, median cells short, 3–6:1, margins serrulate, costae single, extending $^1/_2$–$^3/_4$ the leaf length; often fruiting, capsules cylindric, arcuate, contracted under mouth when dry.

Habitat: On rotten logs, woody debris, bases of trees in wet places, such as swamps and fens, sometimes on soil banks.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Northumberland, Victoria, York); Nova Scotia (Annapolis, Digby, Hants); Prince Edward Island (Kings).

Range: Newfoundland to Alberta, south to Maryland, Ohio, Illinois, Missouri, Nebraska, Colorado, and Arizona. Europe.

Chromosome Number: n = 20.

2. Leptodictyum riparium (Hedw.) Warnst., Krypt. Fl. Brandenburg 2: 878. 1906.

Hypnum riparium Hedw., Spec. Musc. 241. 1801.

PLATE 277

Plants irregularly branched, stems up to 10 cm long, leaves straight, wide-spreading, mainly complanate, lanceolate, acuminate, 2–5 mm long, median cells long, 6–15:1, margins entire, costae single, extending $^1/_2$–$^3/_4$ the leaf length; rarely fruiting, capsules long-cylindric, arcuate, contracted under mouth when dry.

Habitat: On rocks and boulders in and beside creeks and rivers; also on woody debris in stagnant pools.

Maritime Distribution: Frequent. New Brunswick (Charlotte, Saint John); Nova Scotia (Hants, Inverness, Kings, Pictou, Victoria, Yarmouth); Prince Edward Island (Kings).

Range: Labrador to Yukon Territory, south to Florida, Louisiana, Texas, Arizona, and California. Mexico, West Indies, *Central and South America, Europe, Asia, Africa, *Australia, New Zealand.

Chromosome Number: n = 10, 12, 20, 24, 36, 40.

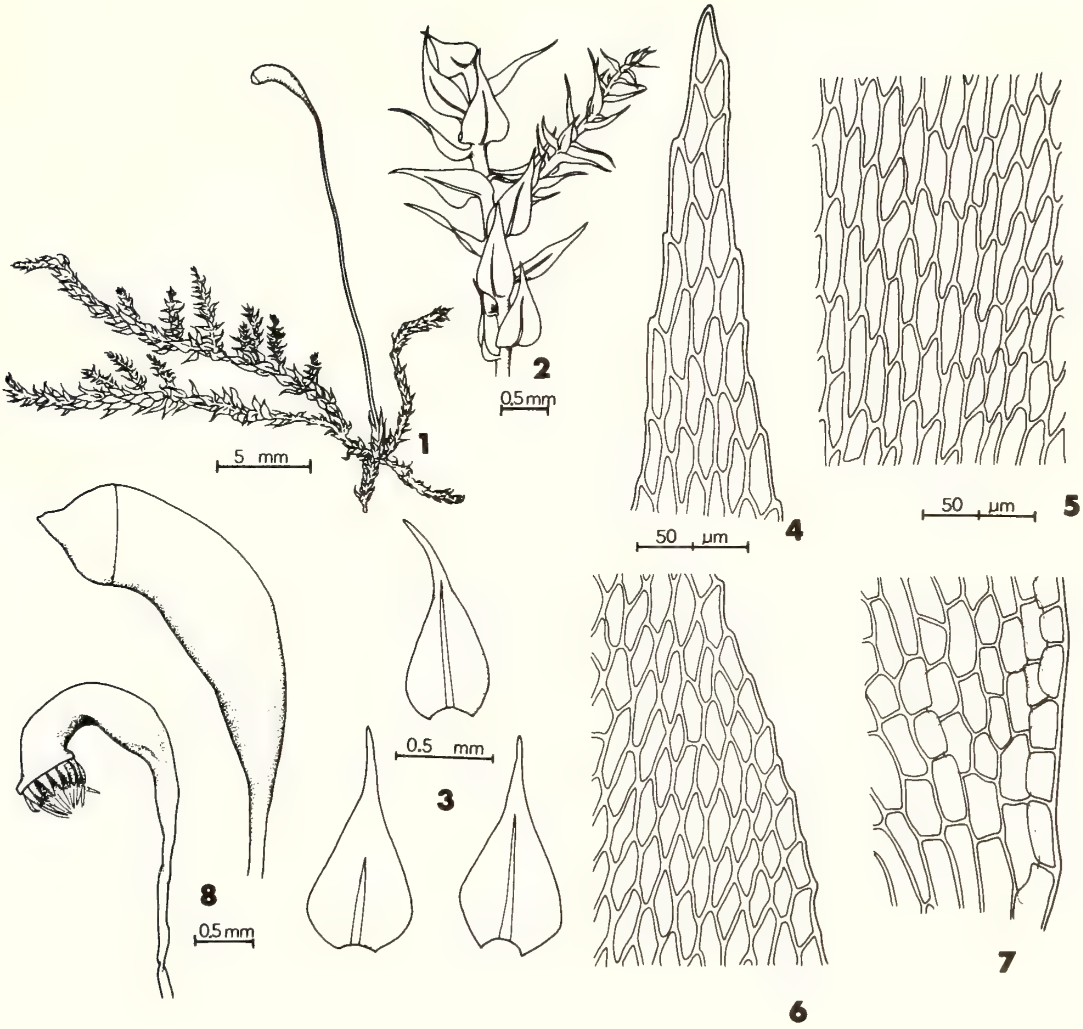
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Plate 276. *Leptodictyum trichopodium*. 1. Habit. 2. Portion of stem and branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

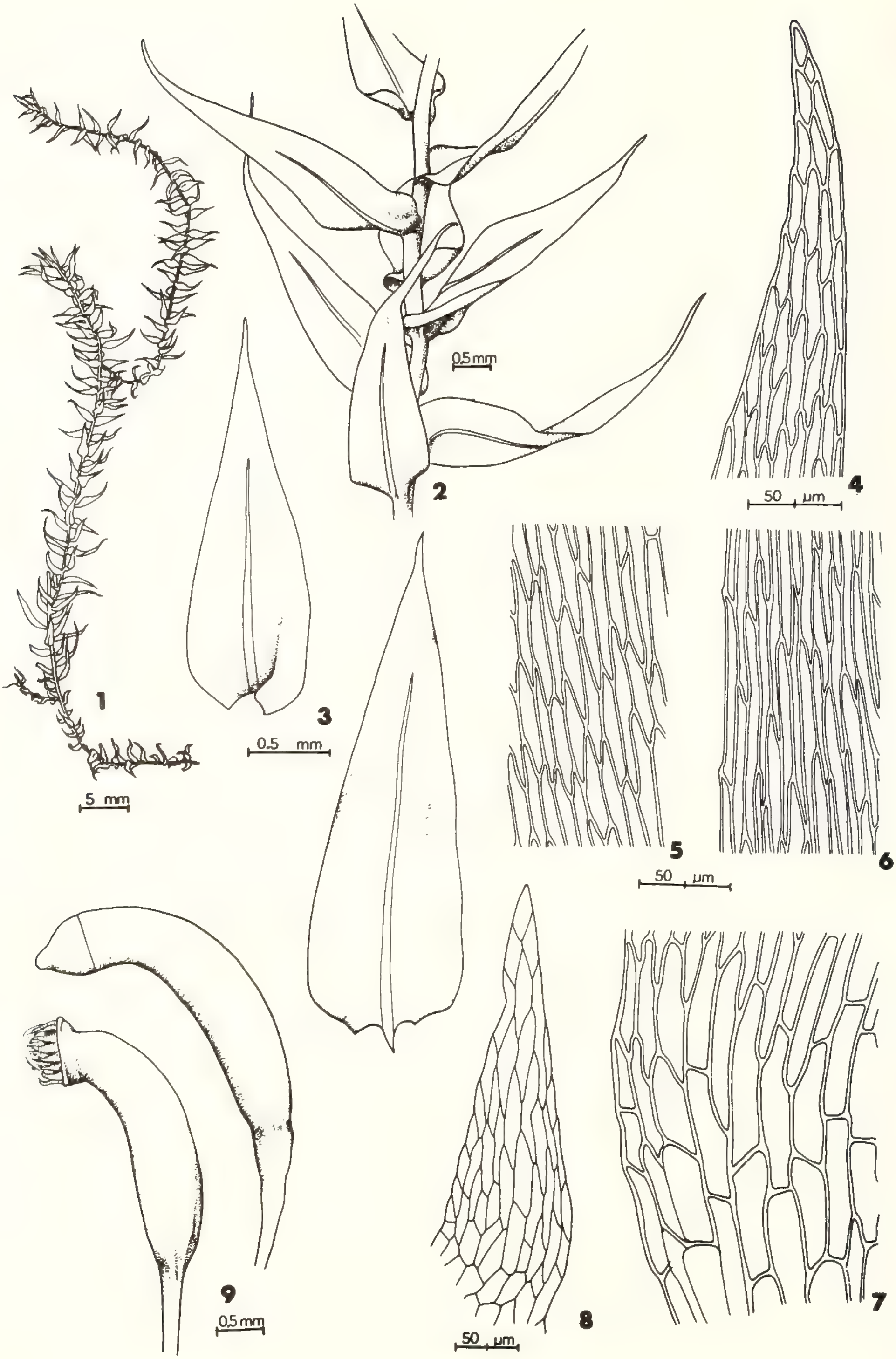
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Plate 277. *Leptodictyum riparium*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllium. 9. Capsules, operculate (wet), inoperculate (dry).

5. **Platydictya** Berk., Handb. Brit. Moss. 145. 1863.
[Synonym: *Amblystegiella* Loeske]

Habit: Prostrate, in dense mats.

Colour: Green to yellowish or brownish green, glossy or sometimes dull.

Stems: 1–2 cm long, creeping, irregularly and sparingly branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth or sometimes papillose, in clusters just below juncture of leaves, mainly on ventral surface of stems. Pseudoparaphyllia lacking or present (*P. subtile*), foliose, lanceolate.

Leaves: Stem and branch leaves similar, close to distant, erect to spreading, sometimes secund, slightly concave, scarcely changed when dry, smooth, lanceolate, acute to acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane, entire to serrulate.

Costae: Single, extending only a short distance above leaf base, or lacking.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits. Median cells rhomboidal or oblong-hexagonal, alar cells quadrate, rectangular or transversely rectangular.

Asexual Reproductive Bodies: Lacking or present (*P. jungermannioides*) as multicellular, cylindric to clavate gemmae clustered in leaf axils.

Sex: Autoicous or dioicous (*P. jungermannioides*).

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, yellow, brown or reddish brown, cylindric to oblong-cylindric, straight to arcuate, erect to cernuous, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, yellow, brown or reddish brown.

Annuli: 1–2 rows of large cells, deciduous.

Opercula: Convex to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–3 cilia, nodulose, sometimes lacking.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 9–14 μm in longest dimension.

1. Mature leaves with a distinct single costa; leaf margins entire or nearly so; alar regions with ± 10 quadrate or transversely rectangular cells on margins; plants autoicous; capsules erect to inclined, straight to slightly arcuate; propagula lacking; occurring on wood ..... 2. *P. subtile*
1. Mature leaves lacking costa or costa scarcely distinct; leaf margins usually minutely serrulate; alar regions with 0–10 quadrate or rarely transversely rectangular cells on margins; plants autoicous or dioicous; propagula sometimes present; occurring on rock or humus over rock 2
    2. Propagula sometimes present; plants dioicous; capsules erect and straight .... 3. *P. jungermannioides*
    2. Propagula lacking; plants autoicous; capsules cernuous and arcuate ... 1. *P. confervoides*

1. Platydictya confervoides (Brid.) Crum, Michigan Bot. 3: 60. 1964.
Hypnum confervoides Brid., Spec. Musc. 2: 153. 1812.
[Synonyms: *Amblystegiella confervoides* (Brid.) Loeske; *Amblystegium confervoides* (Brid.) B.S.G.]
PLATE 278

Plants prostrate, small, dark green, rigid, leaves ecostate, lanceolate to ovate-lanceolate, acuminate, 0.2–0.4 mm long, margins minutely serrulate, 3–8 quadrate or transversely rectangular cells on basal margins; autoicous, capsules cernuous, arcuate, 0.8–1.5 mm long.

Habitat: On shaded, calcareous pebbles, boulders and cliffs, usually along streams.

Maritime Distribution: Rare. New Brunswick (Restigouche, Victoria); Nova Scotia (Victoria).

Range: Labrador to Ontario, south to Florida, Tennessee, Arkansas, and Texas; also in *British Columbia. Europe.

Chromosome Number: n = 10.

2. Platydictya subtile (Hedw.) Crum, Michigan Bot. 3: 60. 1964.

Leskea subtilis Hedw., Spec. Musc. 221. 1801. [Synonyms: *Amblystegiella subtilis* (Hedw.) Loeske; *Amblystegium subtile* (Hedw.) B.S.G.] PLATE 279

Plants largest of the genus, leaves 0.3–0.6 mm long, with short, single costae, margins entire or nearly so, usually 10 or more quadrate or transversely rectangular cells on basal margins, foliose pseudoparaphyllia present; autoicous, capsules erect to inclined, straight to slightly arcuate, 1.0–1.5 mm long.

Habitat: On tree trunks and rotten logs.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Victoria, York); Nova Scotia (Annapolis, Colchester, Victoria); Prince Edward Island (Queens).

Range: Labrador to Ontario, south to *Pennsylvania, Ohio, Michigan, and *Illinois; also in Texas. Europe, *Asia.

Chromosome Number: n = 10.

3. Platydictya jungermannioides (Brid.) Crum, Michigan Bot. 3: 60. 1964.

Hypnum jungermannioides Brid., Spec. Musc. 2: 255. 1812.

[Synonyms: *Amblystegiella jungermannioides* (Brid.) Giac.; *A. sprucei* (Bruch) Loeske] PLATE 278

Somewhat similar to *P. confervoides* but differing by the dioicous plants with erect, straight capsules and the multicellular, cylindrical to clavate, axillary gemmae that are sometimes present.

Habitat: On calcareous boulders and cliffs.

Maritime Distribution: Rare. New Brunswick (Restigouche, Westmorland); Nova Scotia (Victoria).

Range: Greenland to Alaska, south to New Brunswick, southern Quebec, and Michigan; also in Colorado, Idaho, Washington, and California. Europe.

Chromosome Number: Unreported.

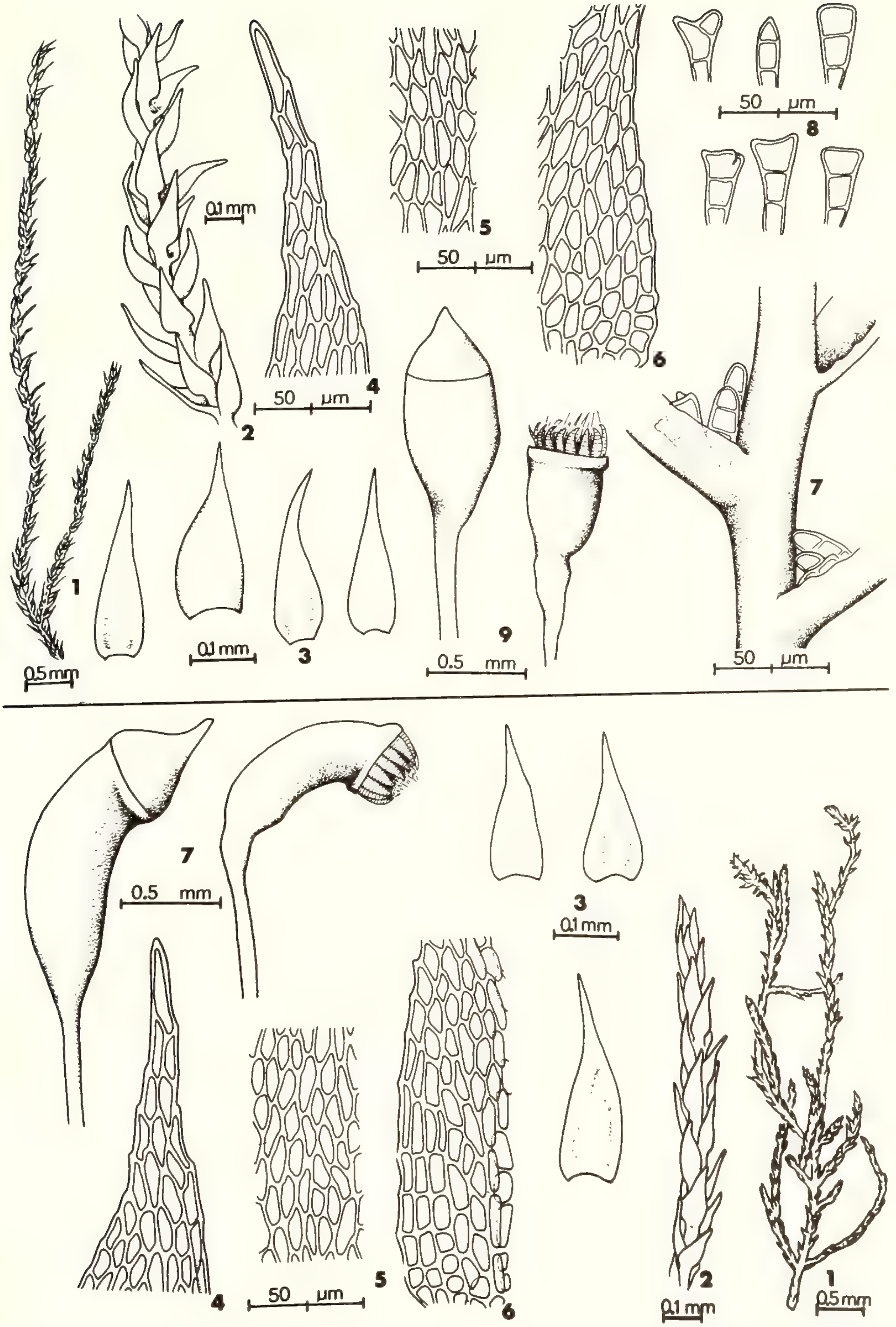
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Plate 278. *Platydictya jungermannioides* (above). 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median. 6, median-marginal and alar.). 7. Portion of stem with gemmae. 8. Gemmae. 9. Capsules, operculate (wet), inoperculate (dry). *Platydictya confervoides* (below). 1. Habit. 2. Portion of stem. 3. Leaves. 4–6. Leaf cells (4, apical. 5, median. 6, median-marginal and alar.). 7. Capsules, operculate (wet), inoperculate (dry).

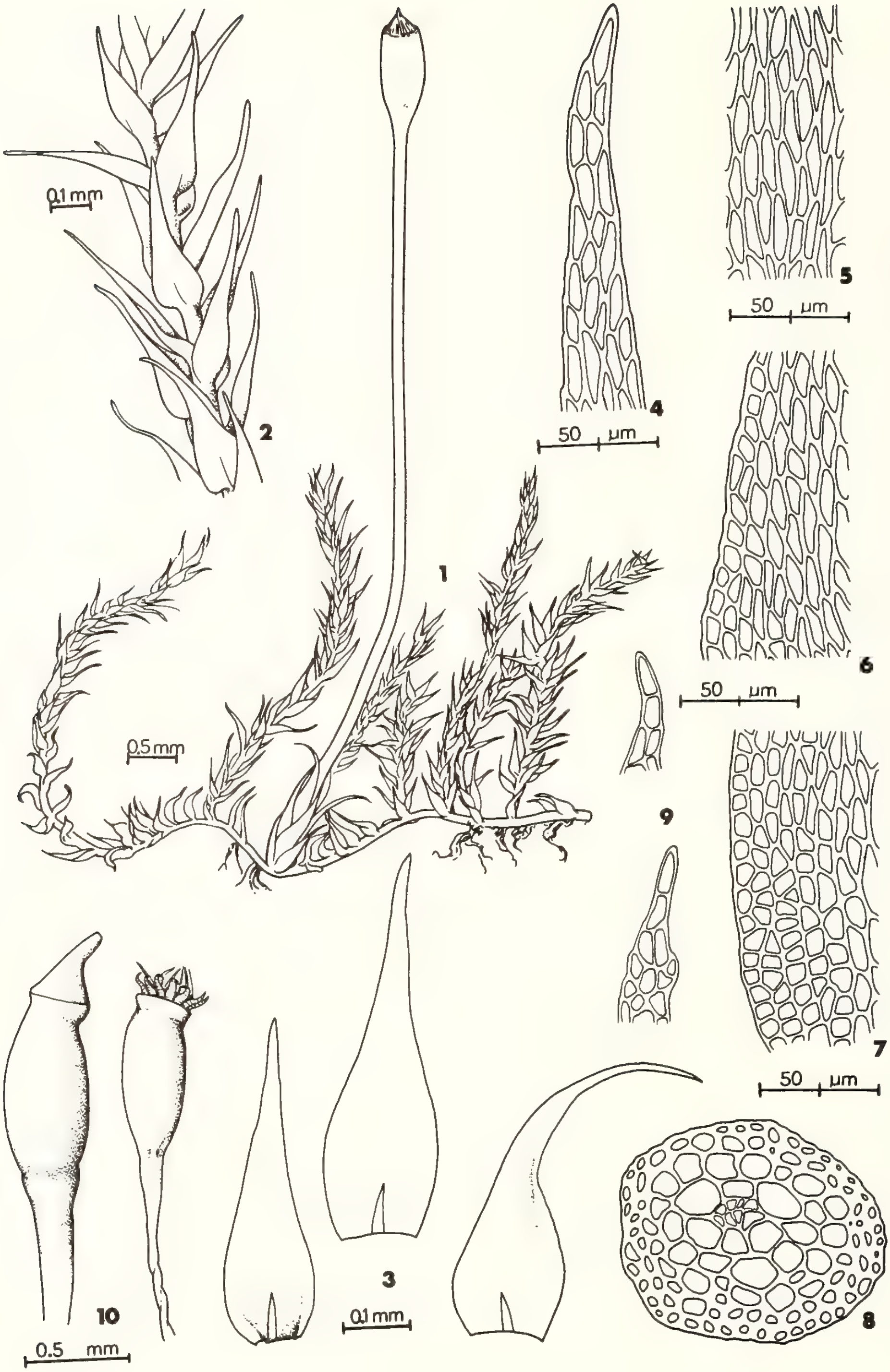
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Plate 279. *Platydictya subtile*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of stem. 9. Pseudoparaphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

6. **Campylium** (Sull.) Mitt., J. Linn. Soc. Bot. 12: 631. 1869.
Hypnum sect. *Campylium* Sull., Man. Bot. No. U.S. ed. 2: 677. 1856.
[Synonym: *Chrysohypnum* Roth]

Habit: Prostrate to erect, in loose to dense tufts or mats.

Colour: Green to yellowish green, brownish green with age, glossy.

Stems: 2–10 cm long, erect or prostrate, irregularly to subpinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth or minutely papillose, in clusters just below juncture of leaves primarily on ventral surface of stems. Pseudoparaphyllia foliose or some filamentous, linear to lanceolate, present in *C. halleri* and *C. hispidulum*.

Leaves: Stem and branch leaves similar, close to distant, erect-spreading to squarrose, sometimes falcate-secund, somewhat twisted and contorted when dry, smooth, lanceolate, ovate or cordate, narrowed to a channelled acumen, shortly decurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane or recurved at base, involute in the acumen, entire, serrulate or serrate.

Costae: Single and strong, or short and double, sometimes lacking, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick or of medium thickness, sometimes pitted nearly to apex. Median cells fusiform to vermicular, often differentiated in alar region, gradually or abruptly enlarged and inflated, sometimes quadrate to short-rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous, dioicous or polygamous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, brown or reddish brown.

Annuli: 1–3 rows of large cells, persistent or deciduous.

Opercula: Conic, usually apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 9–16 μm in longest dimension.

1. Costae strong, single, reaching the middle of the leaves or beyond 2
  2. Plants with squarrose or falcate-secund leaves 3
    3. Leaves squarrose .... 5. *C. chrysophyllum*
    3. Leaves falcate-secund .... 5a. *C. chrysophyllum* var. *brevifolium*
  2. Plants with erect- to wide-spreading leaves 4
    4. Stem leaves lanceolate to ovate-lanceolate, gradually acuminate, alar cells enlarged and inflated .... 4. *C. polygamum*
    4. Stem leaves cordate-ovate, abruptly acuminate, alar cells not inflated but gradually enlarged .... 6. *C. radicale*
1. Costae weak, double or lacking, rarely single but if so, ending far below middle of the leaves 5
  5. Plants large, leaves often 2 mm or more long; alar cells abruptly enlarged or inflated; pseudoparaphyllia lacking .... 3. *C. stellatum*
  5. Plants small, leaves seldom reaching 1.5 mm long; alar cells not abruptly enlarged or inflated; pseudoparaphyllia present but rare 6
    6. Plants yellowish brown or brownish green; leaves crowded, bases imbricate, margins entire or serrate at apices, serrulate near recurved bases .... 1. *C. halleri*
    6. Plants green or yellowish green, rarely yellowish brown; leaves distant, bases rarely touching, margins serrulate to serrate near plane or rarely recurved bases .... 2. *C. hispidulum*

1. **Campylium halleri** (Hedw.) Lindb., Musci Scand. 38. 1879.
Hypnum halleri Hedw., Spec. Musc. 279. 1801.
[Synonym: *Campylophyllum halleri* (Hedw.) Fleisch.]
PLATE 280

Plants small, leaves 0.5–0.8 mm long, squarrose-recurved, costae short and double, sometimes lacking, and alar cells not abruptly enlarged, quadrate to short-rectangular. About the size of the next species, *C. hispidulum*, but the leaves are crowded with imbricate bases and the basal margins are recurved and entire to serrulate.

Habitat: On shady limestone boulder.

Maritime Distribution: Rare. New Brunswick (Victoria). Collected in the canyon of Grand Falls, 47°03′N, 67°44′W, 7 August 1968 (*Ireland 9937*).

Range: Labrador to Quebec, south to New Brunswick; disjunct to Alaska, Yukon Territory, Alberta, British Columbia, and Colorado. Europe, *Asia.

Chromosome Number: Unreported.

2. **Campylium hispidulum** (Brid.) Mitt., J. Linn. Soc. Bot. 12: 631. 1869.
Hypnum hispidulum Brid., Spec. Musc. 2: 198. 1812.
PLATE 281

Plants about the same size as the preceding, *C. halleri*, but with distant leaves, the bases rarely touching, and the basal margins usually plane, rarely recurved, and serrulate to serrate.

Habitat: On rotten logs, soil, rocks and bases of trees.

Maritime Distribution: Common. New Brunswick (Carleton, Charlotte, Kent, Northumberland, Queen's, Restigouche, York); Nova Scotia (Colchester, Halifax, Hants, Lunenburg, Pictou, Queens, Victoria).

Range: Labrador to Alaska, south to North Carolina, Alabama, Mississippi, and Texas. Mexico, West Indies, *Central and *South America, Europe, *Asia.

Chromosome Number: n = 10, 14.

3. **Campylium stellatum** (Hedw.) C. Jens., Medd. Groenland 3: 328. 1887.
Hypnum stellatum Hedw., Spec. Musc. 280. 1801.
[Synonym: *C. stellatum* var. *protensum* (Brid.) Bryhn *ex* Grout]
PLATE 282

Plants moderately large, leaves 1.5–3.0 mm long, wide-spreading to squarrose, costae short and double, sometimes lacking, and alar cells abruptly inflated. The spreading leaf tips at the stem and branch apices are often distinctive.

Habitat: A calciphile, in fens, meadows, bogs, beside lakes, rarely on wet rocks.

Maritime Distribution: Common. New Brunswick (Saint John, Victoria, York); Nova Scotia (Cape Breton, Halifax, Inverness, Kings, Richmond, Victoria, Yarmouth).

Range: Greenland to Alaska, south to North Carolina, Indiana, Minnesota, New Mexico, and Washington. *Central America, Europe, Asia, *Africa.

Chromosome Number: n = 10, 20, 22.

4. **Campylium polygamum** (B.S.G.) C. Jens., Medd. Groenland 3: 329. 1887.
Amblystegium polygamum B.S.G., Bryol. Eur. 6: 60. 572. 1853 (fasc. 55–56 Mon. 16.10).
[Synonym: *Hypnum polygamum* (B.S.G.) Wils.]
PLATE 283

Plants with erect- to wide-spreading leaves with a single costa. The lanceolate to ovate-lanceolate, gradually acuminate stem leaves and the abruptly inflated alar cells will distinguish it from *C. radicale*.

Habitat: In fens, meadows and on rock beside creeks.

Maritime Distribution: Rare. Nova Scotia (Inverness, Queens); Prince Edward Island (Queens).

Range: Greenland to Alaska, south to Florida, Ohio, Michigan, Colorado, and California. South America, Europe, Asia, *Africa, *Australia, *New Zealand, Pacific Islands.

Chromosome Number: n = 11, 20.

5. **Campylium chrysophyllum** (Brid.) J. Lange, Nomencl. Fl. Dan. 210. 1887.
Hypnum chrysophyllum Brid., Musc. Rec. 2(2): 84. 1801.
[Synonym: *Hypnum sinuolatum* (Kindb.) Kindb.]
PLATE 284

Plants with squarrose leaves that have a single costa reaching to the middle of the leaves or somewhat beyond.

Habitat: On rock, base of trees, rotten wood and wet soil.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Queen's, Restigouche, Saint John, Victoria); Nova Scotia (Annapolis, Antigonish, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Pictou, Victoria); Prince Edward Island (Kings, Prince).

Range: Labrador to Yukon Territory, south to Florida, Louisiana, Texas, and Arizona. Mexico, West Indies, South America, Europe, Asia.

Chromosome Number: n = 9, 10, 20.

5a. Campylium chrysophyllum var. **brevifolium** (Ren. & Card.) Grout, Moss. Handl. Microsc. 324. 1910.

Hypnum chrysophyllum var. *brevifolium* Ren. & Card., Bull. Herb. Boiss. 4: 19. 1896.

PLATE 284

Differing from the var. *chrysophyllum* only by the falcate-secund leaves.

Habitat: On rotten wood and boulders beside streams.

Maritime Distribution: Rare. Nova Scotia (Inverness, Kings).

Range: Endemic to eastern North America, from Newfoundland to Ontario, south to North Carolina, Alabama, Louisiana, and Texas.

Chromosome Number: Unreported.

6. Campylium radicale (P. Beauv.) Grout, Bryologist 12(6): 96. 1909.

Hypnum radicale P. Beauv., Prodr. 68. 1805.

PLATE 285

Somewhat similar to *C. polygamum* but differing in the stem leaves that are cordate-ovate, abruptly acuminate and possess alar cells that are gradually enlarged.

Habitat: In bogs and at margins of lakes.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Victoria, Yarmouth).

Range: Poorly known but scattered across the continent. Known from Newfoundland, Nova Scotia, *New Brunswick, *Quebec, Ontario, *Manitoba, *Saskatchewan, Alberta, *British Columbia, Northwest Territories, *Michigan, and Colorado. *Central America, Europe.

Chromosome Number: Unreported.

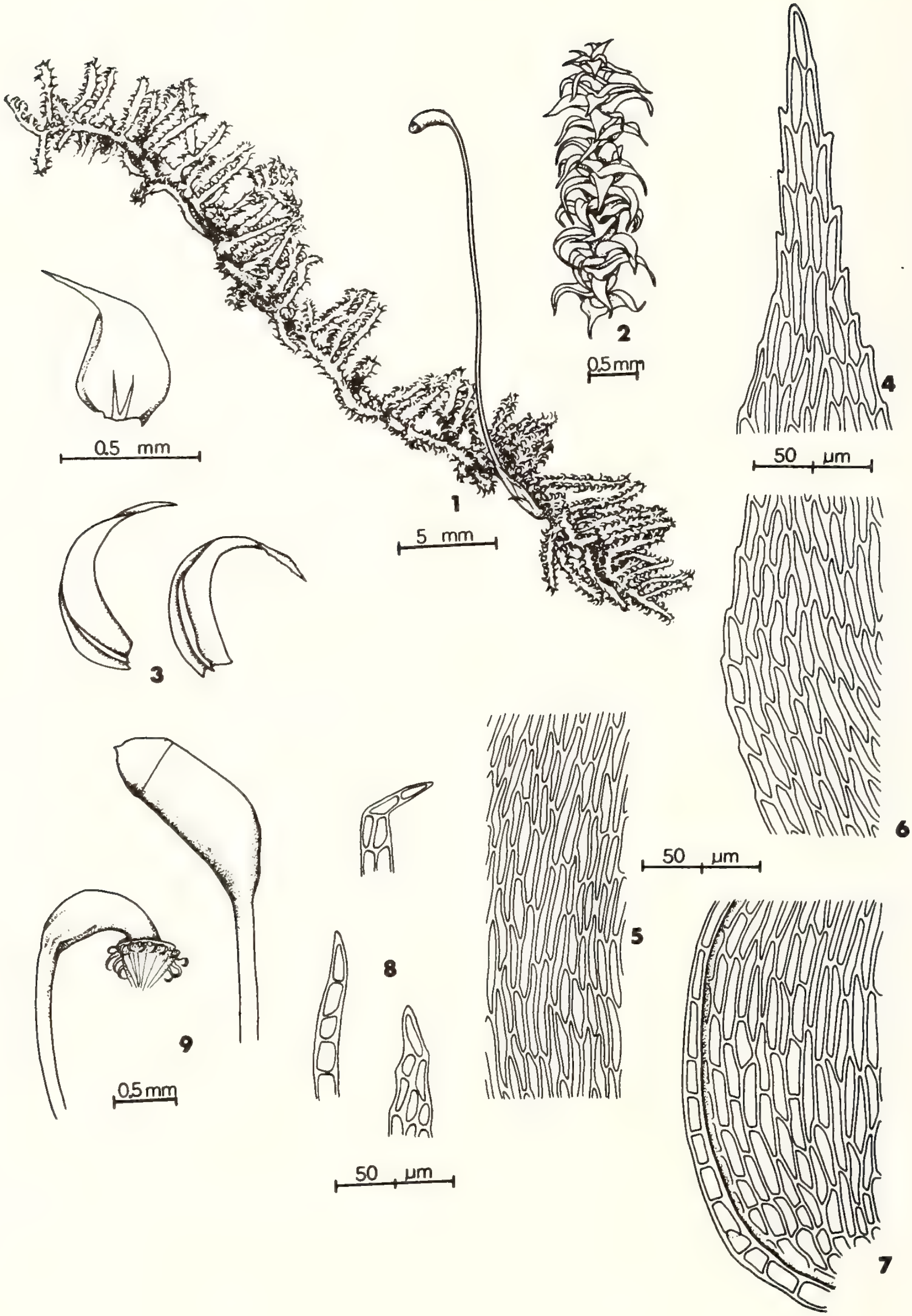
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Plate 280. *Campylium halleri*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Capsules, operculate (wet), inoperculate (dry).

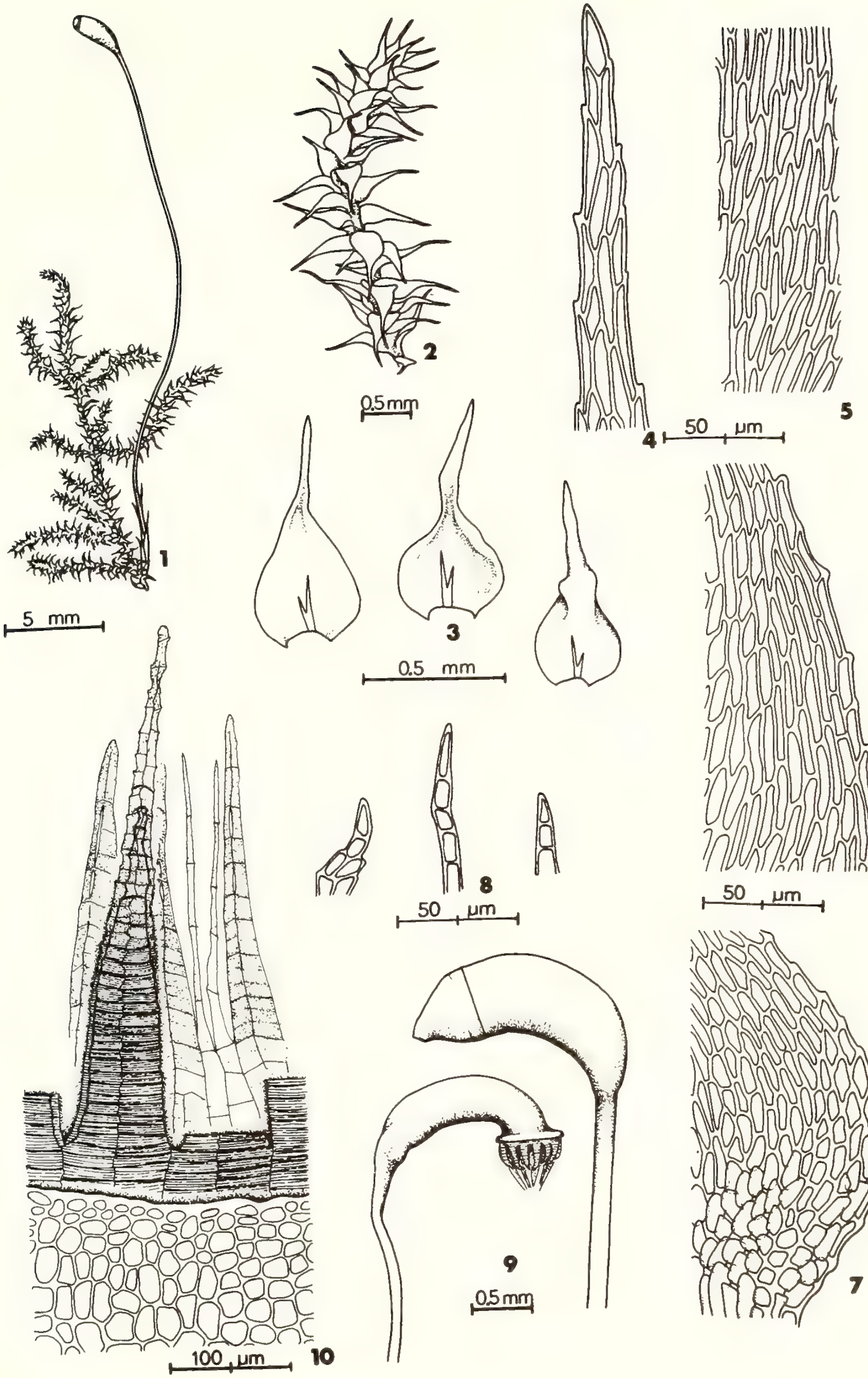
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Plate 281. *Campylium hispidulum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

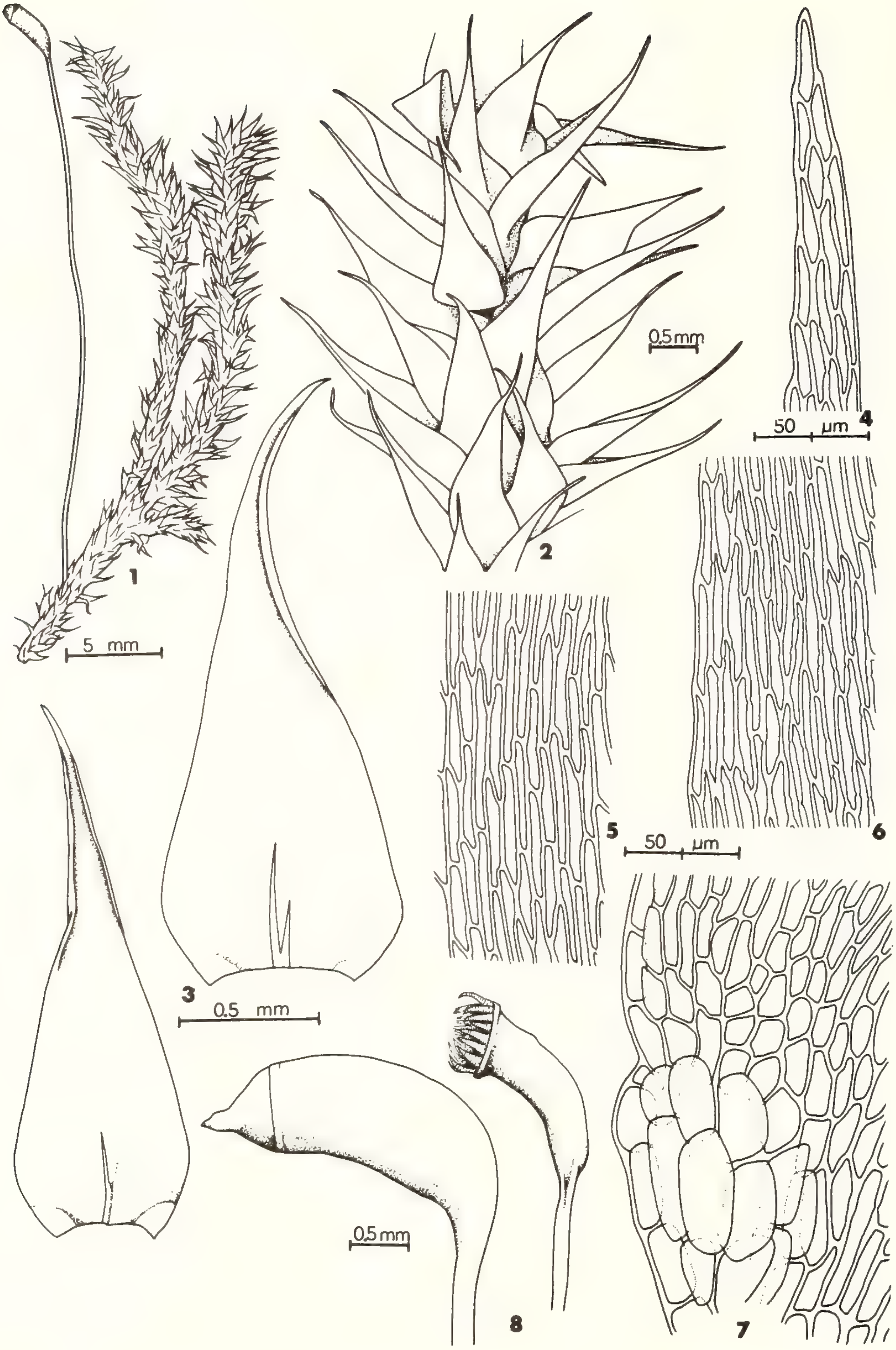
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Plate 282. *Campylium stellatum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

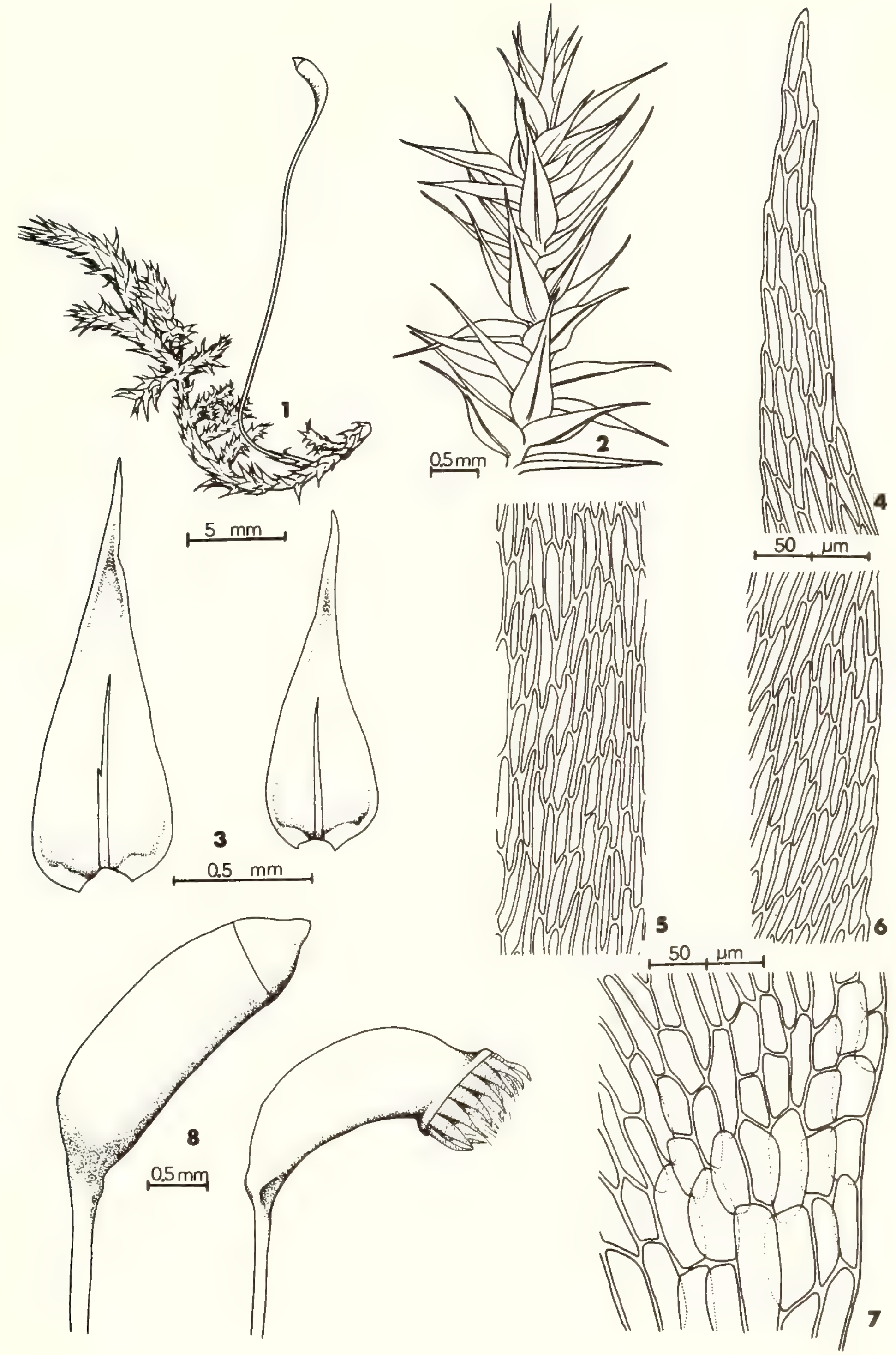
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Plate 283. *Campylium polygamum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

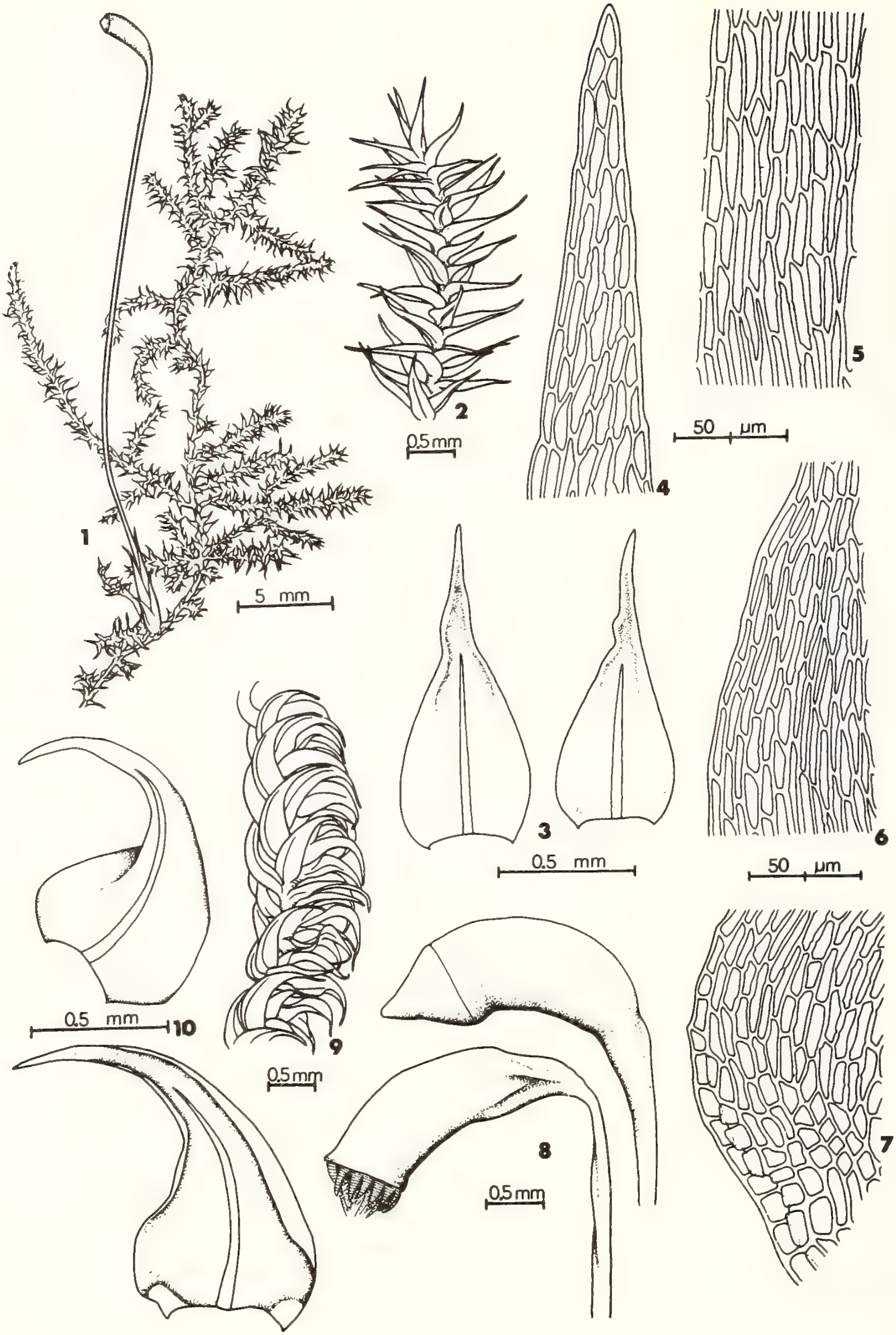
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Plate 284. *Campylium chrysophyllum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9–10. *Campylium chrysophyllum* var. *brevifolium*. 9. Portion of branch. 10. Leaves.

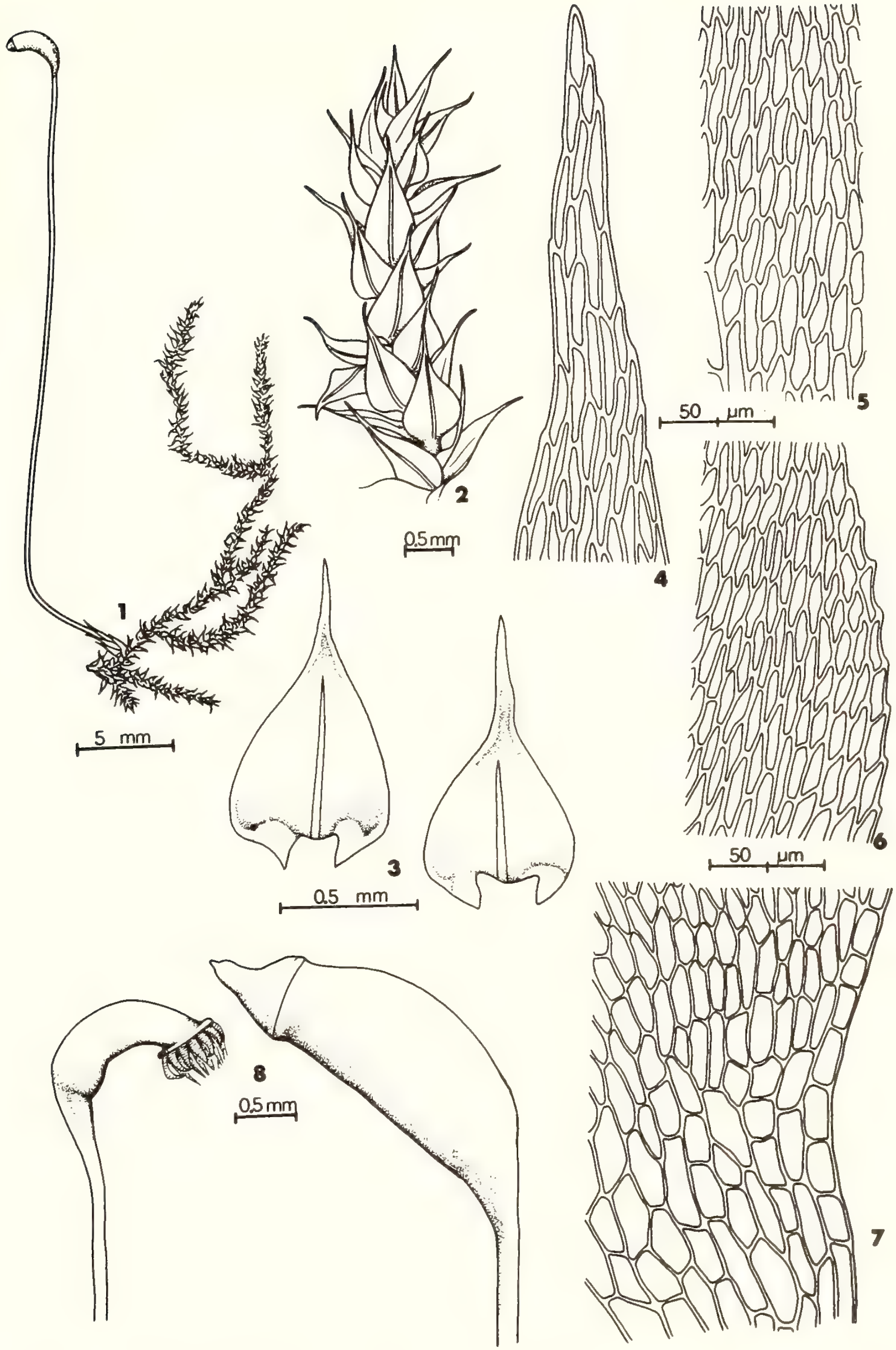
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Plate 285. *Campylium radicale*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

7. **Cratoneuron** (Sull.) Spruce, Cat. Musc. Amaz. And. 21. 1867.

Hypnum sect. *Cratoneuron* Sull., Man. Bot. No. U.S. ed. 2: 673. 1856.

Habit: Prostrate to erect, in loose to dense tufts or mats.

Colour: Dark green to yellowish green, brownish green with age, often glossy.

Stems: 3–8 cm long, prostrate or erect, irregularly to pinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth, in clusters just below juncture of leaves along stems. Paraphyllia few to numerous, foliose to almost filamentous, lanceolate.

Leaves: Stem and branch leaves similar, close to distant, erect to erect-spreading, sometimes falcate-secund, somewhat twisted and contorted when dry, smooth or stem leaves sometimes plicate, lanceolate to ovate-lanceolate, acuminate, decurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane or slightly recurved at base, serrulate to serrate throughout, sometimes entire near apex.

Costae: Single, usually strong, subpercurrent to shortly excurrent, prominent on dorsal surface.

Leaf Cells: Smooth or prorate on dorsal surface, thin- or thick-walled, lacking pits or a few basal cells indistinctly pitted. Median cells linear to oblong or oblong-rhomboidal, alar cells abruptly enlarged and inflated.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong-cylindric, arcuate, horizontal to cernuous, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, brown to reddish brown.

Annuli: 1–3 rows of small cells, deciduous.

Opercula: Conic-apiculate to short-rostrate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 14–22 μm in longest dimension.

1. Stem leaves plicate, strongly falcate-secund; alar cells weakly differentiated; leaf cells prorate on dorsal surface, the median long and narrow, 6–15:1; paraphyllia numerous .... 1. *C. commutatum* var. *falcatum*

1. Stem leaves smooth, straight or somewhat falcate-secund; alar cells strongly differentiated; leaf cells smooth, the median short and broad, 3–8:1; paraphyllia few .... 2. *C. filicinum*

1. Cratoneuron commutatum var. **falcatum** (Brid.) Mönk., Hedwigia 50: 269. 1911.
Hypnum falcatum Brid., Musc. Rec. 2(2): 63. 1801.
[Synonym: *C. falcatum* (Brid.) Roth]
PLATE 286

Similar to *C. filicinum* but differing by the more abundant paraphyllia, the plicate stem leaves that are more strongly falcate-secund, the linear median leaf cells, 6–15:1, that are prorate on the dorsal surface and the weakly differentiated alar cells.

Habitat: On wet (calcareous?) cliff.

Maritime Distribution: Rare. Nova Scotia (Inverness, Victoria).

Range: Labrador to Alaska, south to Nova Scotia, Michigan, Colorado, Utah, Nevada, and Oregon. Europe, Asia, *Africa.

Chromosome Number: n = 7, 10.

2. Cratoneuron filicinum (Hedw.) Spruce, Cat. Musc. Amaz. And. 21. 1867.

Hypnum filicinum Hedw., Spec. Musc. 285. 1801.

[Synonym: *Amblystegium filicinum* (Hedw.) De Not.]

PLATE 287

Plants 3–8 cm long, irregularly to pinnately branched, with few, scattered foliose paraphyllia and often numerous rhizoids on the stems and branches, stem leaves smooth, often falcate-secund, with a strong subpercurrent to percurrent costa, leaf cells smooth, the median oblong to oblong-rhomboidal, 3–8:1, alar cells abruptly enlarged and inflated.

Habitat: On wet soil and rocks in woods, around springs, in swamps and on seepy bluffs; mainly in calcareous habitats.

Maritime Distribution: Frequent. New Brunswick (Albert, Queen's, Restigouche, Victoria); Nova Scotia (Cape Breton, Colchester, Inverness, Victoria).

Range: Greenland to Alaska, south to New York, *Alabama, Arkansas, *Texas, *New Mexico, Arizona, and California. Mexico, Central and *South America, Europe, Asia, *Africa, *Australia, New Zealand.

Chromosome Number: $n = 10, 20, 30$.

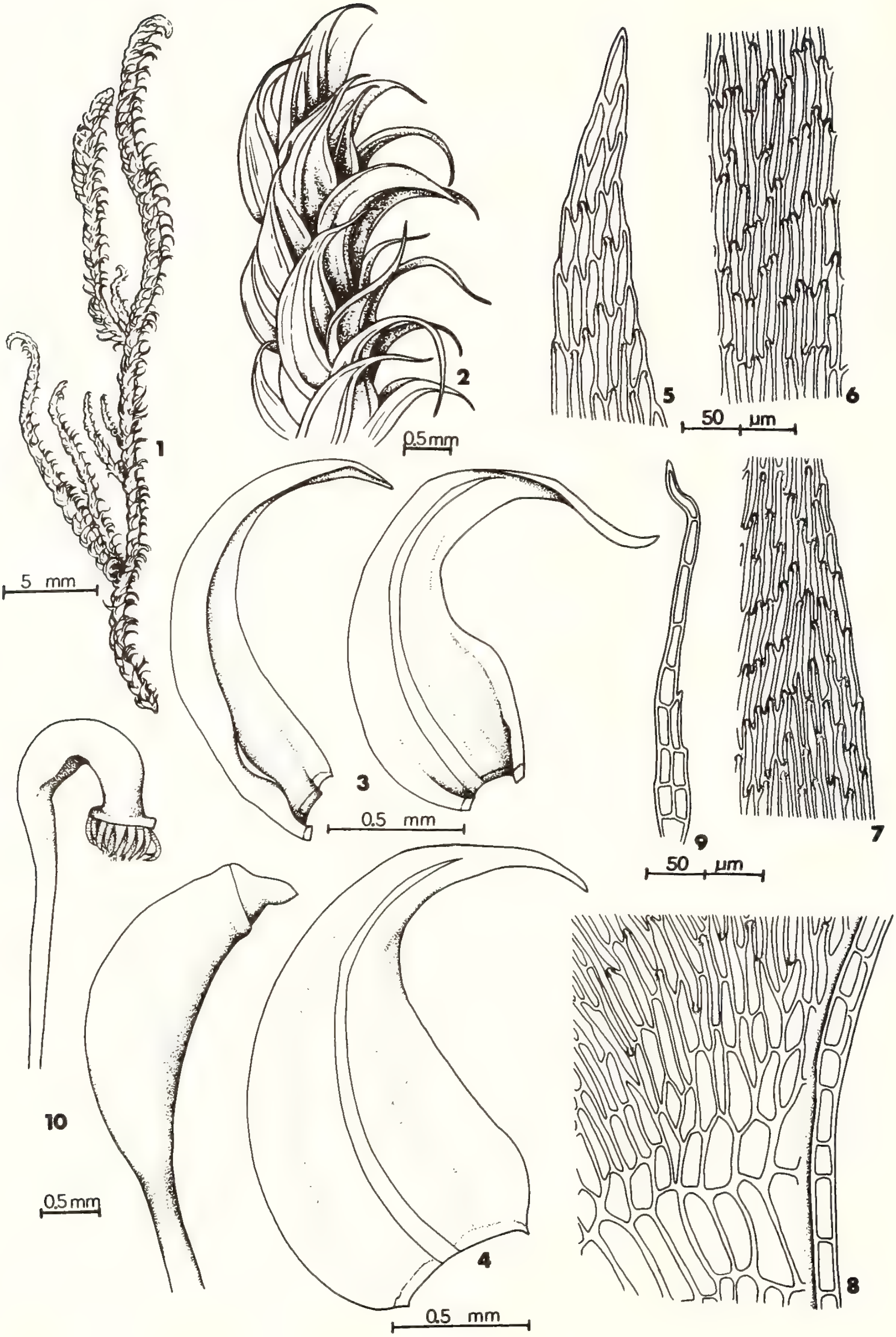
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Plate 286. *Cratoneuron commutatum* var. *falcatum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaf. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Paraphyllium. 10. Capsules, operculate (wet), inoperculate (dry).

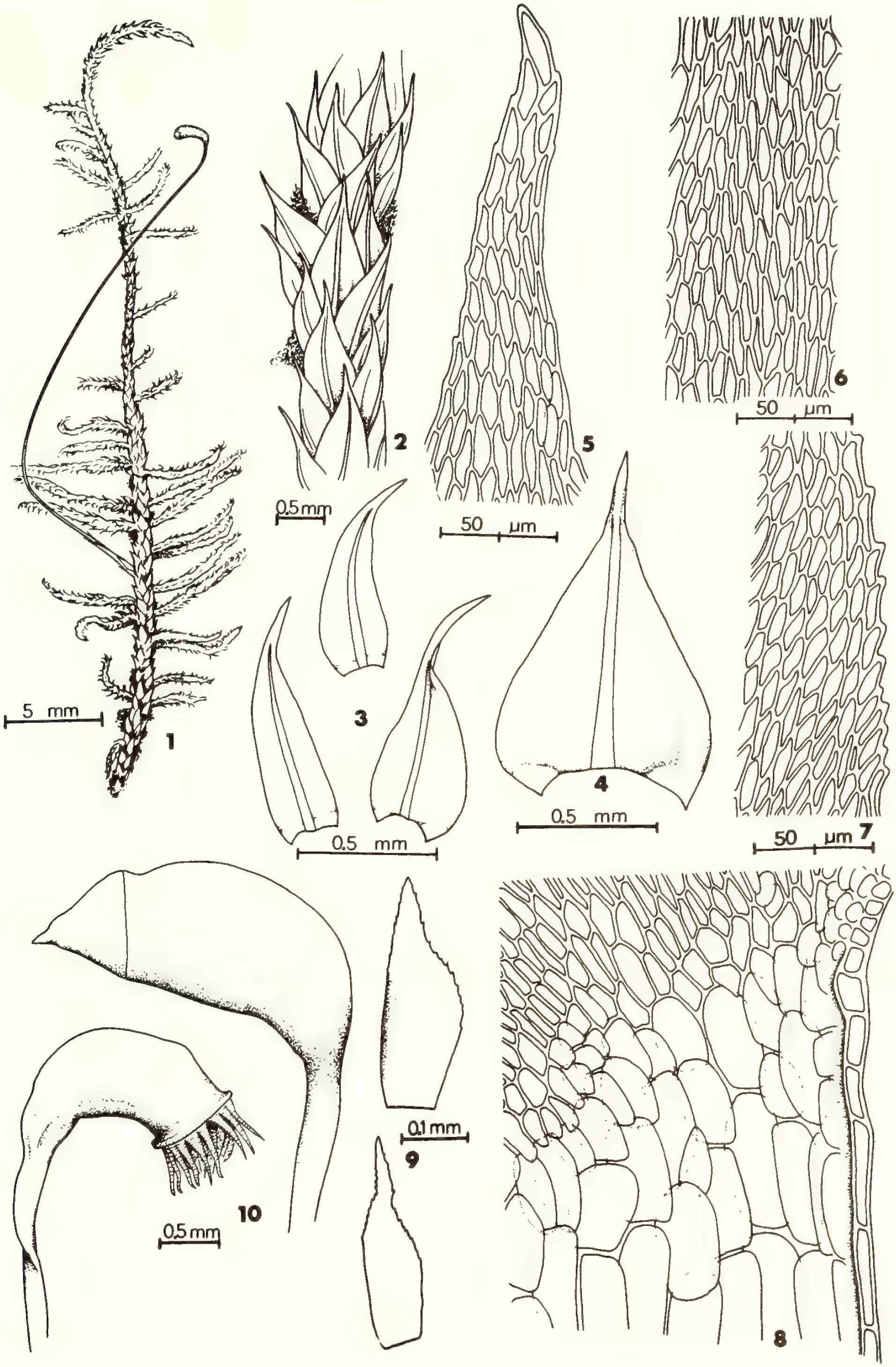
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Plate 287. *Cratoneuron filicinum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaf. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

8. Drepanocladus (C. Müll.) Roth, Hedwigia 38(Beibl.): 6. 1899.
Hypnum subsect. *Drepanocladus* C. Müll., Syn. 2: 321. 1851.

Habit: Prostrate to erect, in loose to dense tufts or mats.

Colour: Green, yellowish green or brownish, sometimes red to black, often glossy.

Stems: 3–20 cm long, prostrate or erect, irregularly to pinnately branched, epidermal cells small and thick-walled or large and thin-walled (*D. revolvens, D. uncinatus*) in cross-section, rhizoids smooth, in clusters just below juncture of leaves along stems. Pseudoparaphyllia foliose, ovate-lanceolate to lanceolate.

Leaves: Stem and branch leaves similar, close to distant, falcate-secund, sometimes erect to erect-spreading, flat to concave, somewhat twisted and contorted when dry, smooth, striate or plicate, lanceolate to ovate-lanceolate, long-acuminate, decurrent or nondecurrent, rhizoids smooth, sometimes on dorsal surface near apices. Perichaetial leaves sheathing base of seta, lanceolate, long-acuminate.

Leaf Margins: Plane to incurved, rarely recurved at base, entire or serrulate to serrate throughout.

Costae: Single, extending to leaf middle or above, sometimes excurrent, often prominent on dorsal surface.

Leaf Cells: Smooth, thin or thick-walled, pitted or nonpitted. Median cells fusiform to vermicular, alar cells often enlarged and inflated, round to oblong, sometimes scarcely differentiated, square to rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, cylindric to oblong-ovoid, arcuate, inclined to horizontal, smooth or somewhat striate, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to flexuose, smooth, slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of large cells, deciduous, or lacking (*D. exannulatus, D. fluitans*).

Opercula: Conic-apiculate to short-rostrate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–24 μm in longest dimension.

Wynne (1944) has a useful publication on the *Drepanocladus* taxa of North America.

1. Leaves entire 2
    2. Alar cells inflated .... 1. *D. aduncus*
    2. Alar cells not inflated 3
        3. Plants green; leaf cells with thin, nonpitted walls; stems lacking a central strand, epidermal cells not enlarged, thick-walled .... 5. *D. vernicosus*
        3. Plants red to black, sometimes green; basal leaf cells with thick, pitted walls; stems with a central strand, epidermal cells enlarged, thin-walled .... 4. *D. revolvens*
1. Leaves serrulate to serrate 4
    4. Leaves plicate, alar cells quadrate, not inflated; stem epidermal cells enlarged, thin-walled .... 6. *D. uncinatus*
    4. Leaves smooth, alar cells round to oblong, inflated; stem epidermal cells not enlarged, thick-walled 5
        5. Costae extending ¾ or more the length of the leaves; inflated basal cells of leaves extending from margins to costa; dioicous .... 2. *D. exannulatus*
        5. Costae extending to middle of leaves, rarely beyond; inflated basal cells of leaves usually not extending to costa; autoicous .... 3. *D. fluitans*

1. Drepanocladus aduncus (Hedw.) Warnst., Beih. Bot. Centralbl. 13: 400. 1903.
Hypnum aduncum Hedw., Spec. Musc. 295. 1801.
[Synonym: *Drepanocladus aduncus* var. *kneiffii* (B.S.G.) Mönk.]

PLATE 288

This is the only member of the genus with entire leaves and inflated alar cells.

Habitat: In bogs, swamps, meadows, wet depressions and drainage ditches.

Maritime Distribution: Common. New Brunswick (Carleton, Queen's, Victoria, York); Nova Scotia (Cape Breton, Halifax, Inverness, Kings, Richmond, Victoria, Yarmouth, Sable Island); Prince Edward Island (Prince, Queens).

Range: Greenland to Alaska, south to New Jersey, Ohio, Indiana, Missouri, Nebraska, Colorado, Arizona, and California. Mexico, South America, Europe, *Asia, *Africa, *Australia, New Zealand.

Chromosome Number: n = 12, 20.

Remarks: I agree with Crum (1976) in not recognizing the var. *kneiffii* (B.S.G.) Mönk. The variety is a weak segregate that is distinguished only on the basis of the leaves that are nearly straight instead of being falcate-secund.

2. **Drepanocladus exannulatus** (B.S.G.) Warnst., Beih. Bot. Centralbl. 13: 405. 1903.
Hypnum exannulatum B.S.G., Bryol. Eur. 6: 110. 603. 1854 (fasc. 57–61 Mon. 34.23).
[Synonym: *Hypnum exannulatum* var. *purpurascens* (Schimp.) Milde]
PLATE 289

Plants with smooth, serrulate to serrate leaves and inflated alar cells that are round to oblong. Close to *D. fluitans* from which it differs by the longer costae, the greater number of inflated basal cells and the dioicous condition.

Habitat: In bogs, swamps, meadows, wet depressions and drainage ditches.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, King's, Madawaska, Queen's, Saint John, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Richmond, Shelburne, Victoria, Sable Island); Prince Edward Island (Kings, Queens).

Range: *Greenland to Alaska, south to *Pennsylvania, Michigan, Wisconsin, Colorado, Utah, and California. Mexico, *South America, Europe, Asia, Africa.

Chromosome Number: n = 11, 12.

3. **Drepanocladus fluitans** (Hedw.) Warnst., Beih. Bot. Centralbl. 13: 404. 1903.
Hypnum fluitans Hedw., Spec. Musc. 296. 1801.
PLATE 290

Similar to *D. exannulatus* but differing in the shorter costae, extending only to the middle of the leaves, the fewer inflated basal cells and the autoicous condition.

Habitat: In bogs, swamps, wet depressions, beside streams and lakes and in pools of water.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, Madawaska, Queen's, Saint John, Westmorland); Nova Scotia (Colchester, Halifax, Queens, Richmond, Shelburne, Victoria, Yarmouth, St. Paul Island); Prince Edward Island (Queens).

Range: Greenland to Alaska, south to New York, *West Virginia, Indiana, Minnesota, *Colorado, and California. *South America, Europe, Asia, *Africa, Australia, New Zealand.

Chromosome Number: n = 20, 22, 24.

4. **Drepanocladus revolvens** (Sw.) Warnst., Beih. Bot. Centralbl. 13: 402. 1903.
Hypnum revolvens Sw., Monthl. Rev. 34: 538. 1801.
PLATE 291

Similar to *D. vernicosus* in the possession of entire leaves and undifferentiated alar cells. Differing from it by the red to nearly black plants with thick, often pitted walls of the basal leaf cells and by the large, thin-walled epidermal cells of the stems.

Habitat: In alkaline bogs, springs and on wet swampy soil.

Maritime Distribution: Rare. Nova Scotia (Halifax, Inverness, Richmond, Victoria, St. Paul Island).

Range: Greenland to Alaska, south to southern Quebec, Michigan, Iowa, Colorado, and Montana. South America, Europe, *Asia.

Chromosome Number: n = 11, 20, 23.

Remarks: Another calciphile, *D. badius* (C.J. Hartm.) Roth, occurs in Newfoundland and its occurrence in the Maritime Provinces is very likely. It somewhat resembles *D. revolvens* macroscopically but differs microscopically by its small, thick-walled epidermal stem cells and its leaf cells that have walls pitted nearly throughout the leaf instead of only at the base as in *D. revolvens*.

5. **Drepanocladus vernicosus** (Mitt.) Warnst., Beih. Bot. Centralbl. 13: 402. 1903.
Stereodon vernicosus Mitt., J. Linn. Soc. Bot. 8:43. 1874.
PLATE 292

Plants with entire leaves and undifferentiated alar cells. Close to *D. revolvens* from which it is distinguished by the leaves' green colour, the leaf cells that have thin, non-pitted walls and by the stems that have small, thick-walled epidermal cells.

Habitat: In alkaline bogs and swamps.

Maritime Distribution: Rare. New Brunswick (Saint John); Nova Scotia (Cape Breton, Victoria); Prince Edward Island (Prince).

Range: *Greenland to Alaska, south to *Pennsylvania, *Ohio, Iowa, Montana, Idaho, and *Oregon. *Central America, Europe, *Asia, *Africa.

Chromosome Number: Unreported.

6. Drepanocladus uncinatus (Hedw.) Warnst., Beih. Bot. Centralbl. 13: 402. 1903.
Hypnum uncinatum Hedw., Spec. Musc. 289. 1801.
[Synonym: *Hypnum moseri* Kindb.]
PLATE 293

Easy to distinguish from the others in the genus because of the strongly plicate leaves with serrulate to serrate margins and quadrate, noninflated alar cells.

Habitat: In woods on bases of trees, humus, rotten logs, rocks, in wet meadows, and in drainage ditches.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Northumberland, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to *Pennsylvania, Ohio, Michigan, Minnesota, Colorado, *Arizona, and California. Mexico, *West Indies, South America, Europe, Asia, *Africa, *Australia, New Zealand, Antarctica.

Chromosome Number: n = 10, 11, 12, 20.

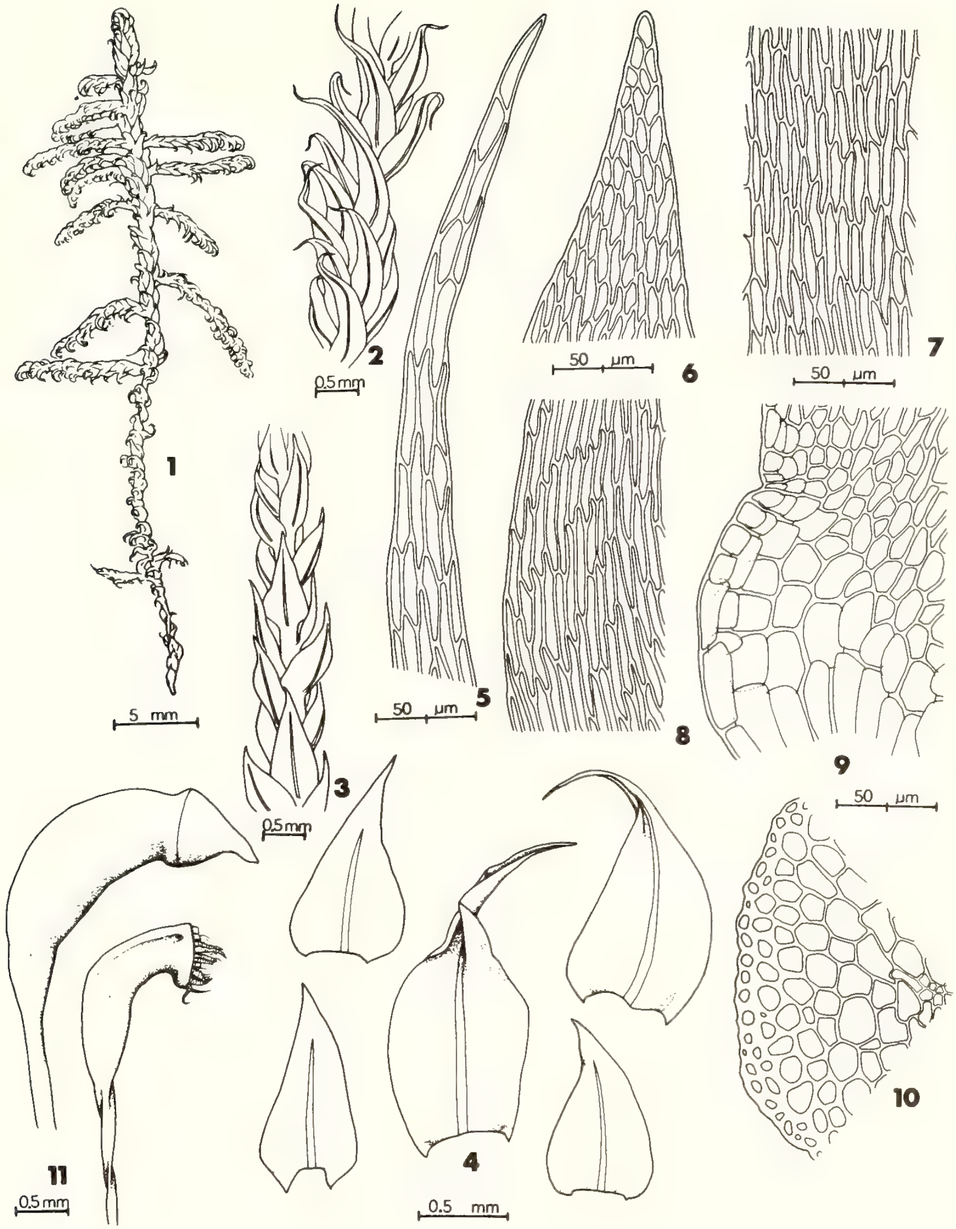
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Plate 288. *Drepanocladus aduncus*. 1. Habit. 2–3. Portion of stems. 4. Leaves. 5–9. Leaf cells (5–6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

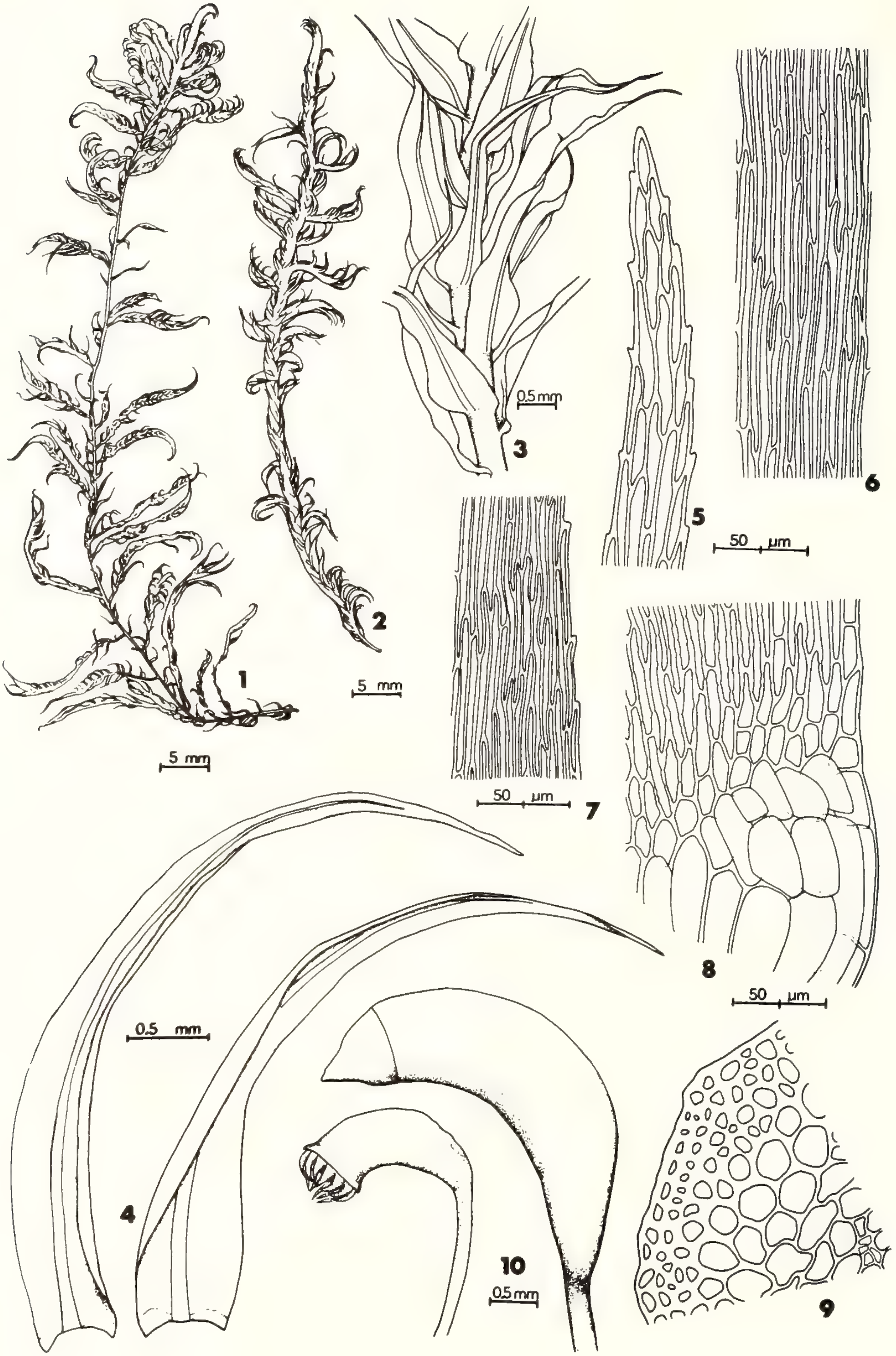
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Plate 289. *Drepanocladus exannulatus.* 1–2. Habit. 3. Portion of stem. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

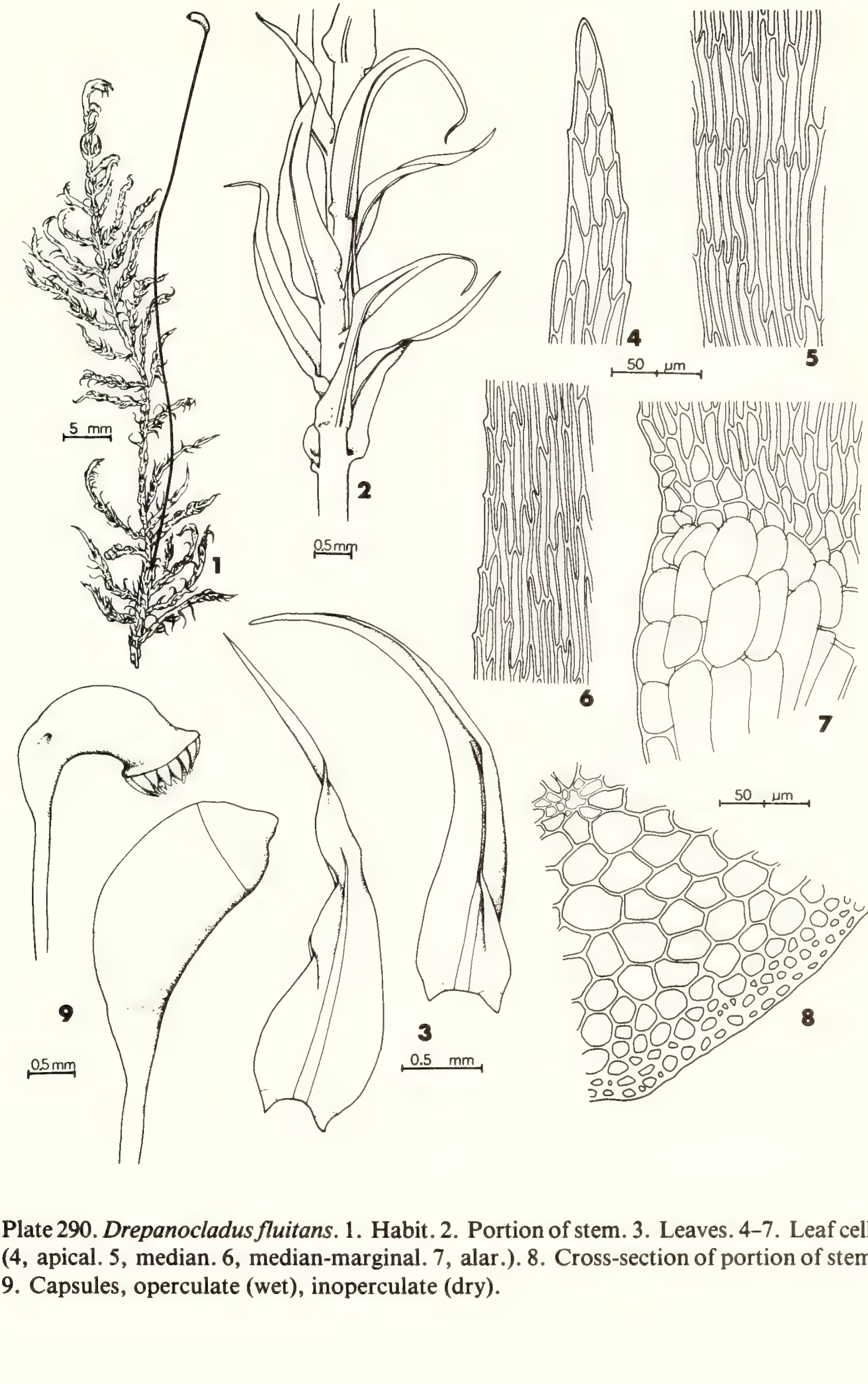
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Plate 290. *Drepanocladus fluitans*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry).

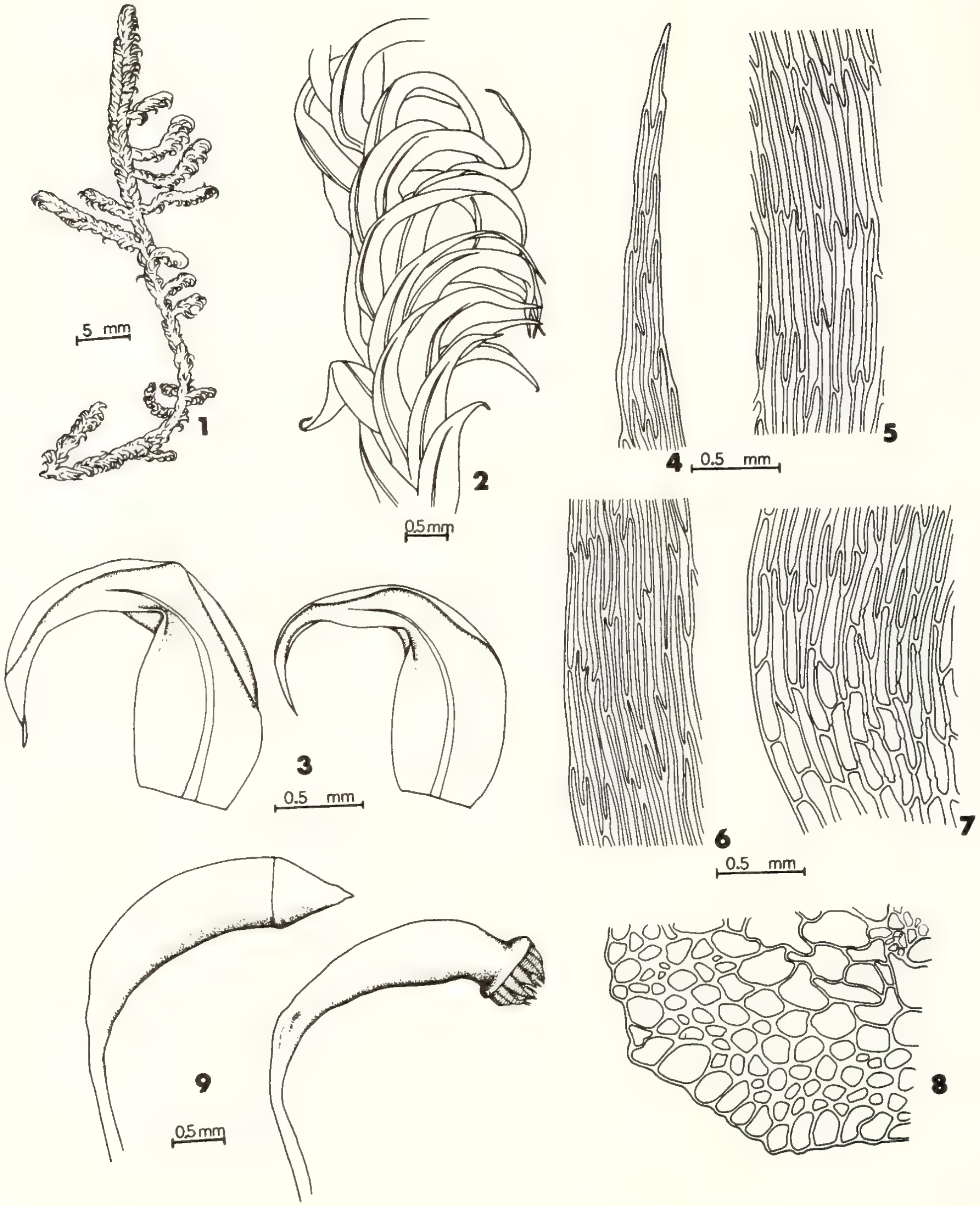
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Plate 291. *Drepanocladus revolvens*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry).

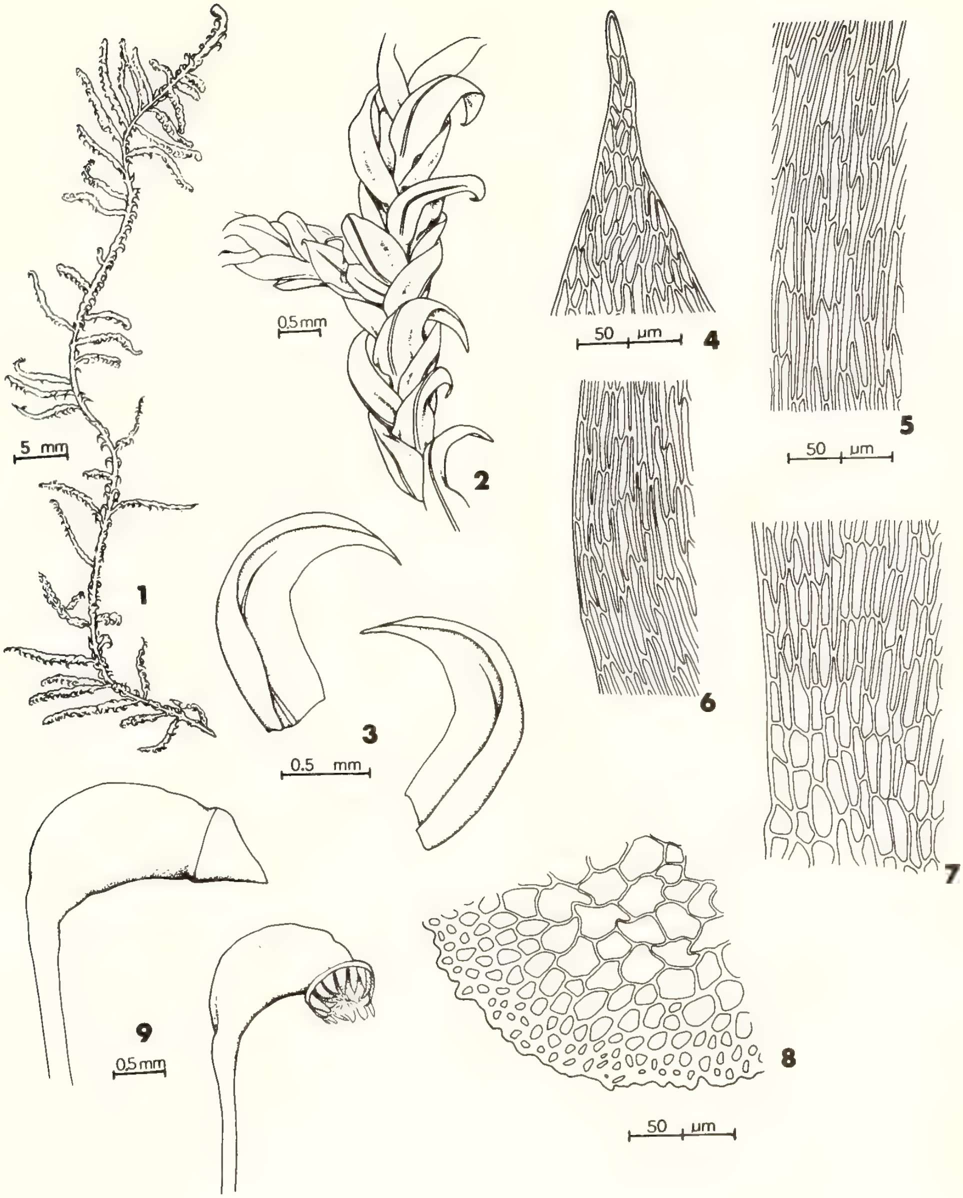
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Plate 292. *Drepanocladus vernicosus*. 1. Habit. 2. Portion of stem and branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry).

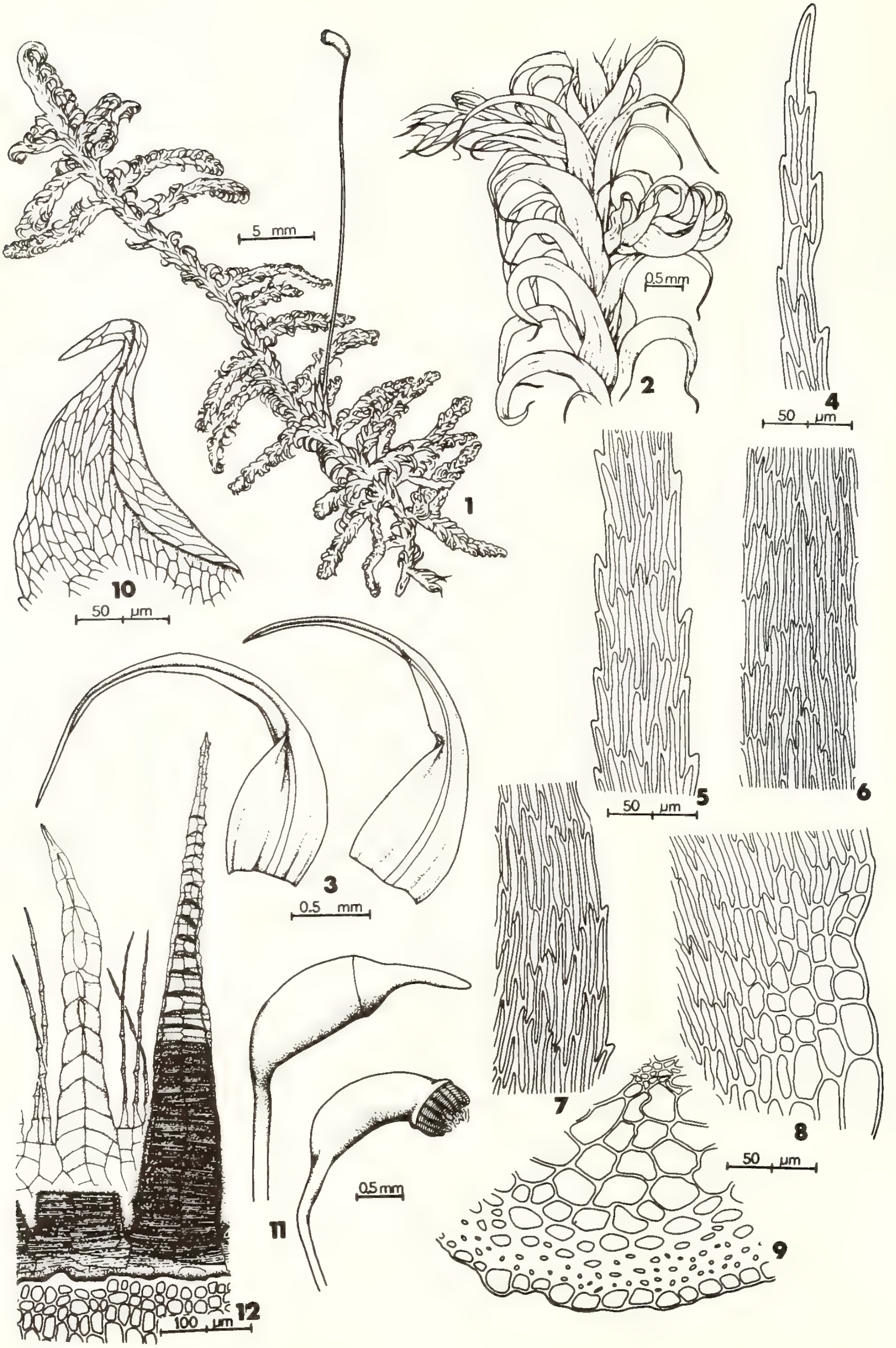
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Plate 293. *Drepanocladus uncinatus*. 1. Habit. 2. Portion of stem and branches. 3. Leaves. 4–8. Leaf cells (4, apical. 5, upper cells (just below apex). 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of portion of stem. 10. Pseudoparaphyllium. 11. Capsules, operculate (wet), inoperculate (dry). 12. Peristome teeth.

9. **Hygrohypnum** Lindb., Act. Soc. Sci. Fenn. 10: 277. 1872.

Habit: Prostrate, in dense mats.

Colour: Green to yellowish or brownish green, dull to glossy.

Stems: 1–8 cm long, creeping, irregularly branched, epidermal cells small and thick-walled or large and thin-walled (*H. ochraceum*) in cross-section, rhizoids smooth, sparse, in clusters just below juncture of leaves along stems. Pseudoparaphyllia foliose, lanceolate.

Leaves: Stem and branch leaves similar, close to distant, erect to squarrose, occasionally falcate-secund, sometimes contorted when dry, smooth, lanceolate, ovate or suborbicular, acute to obtuse, nondecurrent to shortly decurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane, entire or denticulate at apex, sometimes serrulate to serrate throughout.

Costae: Single or double, often variable on same plant, reaching to leaf middle, sometimes weak, rarely lacking.

Leaf Cells: Smooth, the walls thick or of medium thickness, lacking pits. Median cells flexuose to vermicular, alar cells quadrate to oblong, hyaline or coloured, often enlarged and inflated.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, ovoid to oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to flexuose, smooth, slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of small to large cells, persistent or deciduous.

Opercula: Conic to short-rostrate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–3 cilia, rarely lacking, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 14–19 μm in longest dimension.

1. Epidermal cells of the stems enlarged, thin-walled and hyaline .... 1. *H. ochraceum*

1. Epidermal cells of the stems not enlarged, thick-walled 2

    2. Costae single or double, strong, often reaching to the middle of the leaves or beyond 3

        3. Leaves often falcate-secund, small, seldom over 1.5 mm long and 0.5 mm wide, the bases not clasping the stems .... 3. *H. luridum*

        3. Leaves not falcate-secund, large, often over 1.5 mm long and 0.5 mm wide, the bases clasping the stems .... 5. *H. bestii*

    2. Costae double, weak, usually ending below the middle of the leaves, sometimes lacking 4

        4. Leaves ovate to suborbicular, about as broad as long .... 6. *H. duriusculum*

        4. Leaves lanceolate to ovate-lanceolate, longer than broad 5

            5. Leaves often squarrose, margins serrulate to serrate throughout .... 2. *H. montanum*

            5. Leaves not squarrose, margins entire or denticulate at apex .... 4. *H. eugyrium*

1. Hygrohypnum ochraceum (Turn. *ex* Wils.) Loeske, Moosfl. Harz. 321. 1903.
Hypnum ochraceum Turn. *ex* Wils., Bryol. Brit. 400: 58. 1855.
[Synonym: *Hypnum pseudolycopodioides* Kindb. *ex* Nichols]
PLATE 294

Differing from the other species in the enlarged, thin-walled, hyaline epidermal cells of the stem. The other members of the genus have small, thick-walled cells.

Habitat: On soil over rocks in and beside creeks and streams, sometimes beside lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Queen's, Restigouche, Saint John, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Guysborough, Halifax, Hants, Inverness, Kings, Queens, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Greenland to Alaska, south to Maryland, southern Ontario, Minnesota, Colorado, and California. Europe, Asia.

Chromosome Number: n = 10, 11.

2. **Hygrohypnum montanum** (Lindb.) Broth., Nat. Pfl. 1(3): 1039. 1908.
Amblystegium montanum Lindb., Musci Scand. 33. 1879.
[Synonym: *Hygrohypnum eumontanum* Crum, Steere & Anderson]
PLATE 295

Plants with small, lanceolate to ovate-lanceolate, squarrose leaves, 0.5–1.0 mm long, serrulate to serrate margins nearly to base and weak, double costae ending below the leaf middle.

Habitat: On sandy soil over rocks and boulders beside streams.

Maritime Distribution: Rare. New Brunswick (Albert); Nova Scotia (Victoria).

Range: Nova Scotia to Quebec, south to New Hampshire, Vermont, and New York; also in *Newfoundland (?) and *Ontario (?). *Europe, *Asia.

Chromosome Number: Unreported.

3. **Hygrohypnum luridum** (Hedw.) Jenn., Man. Moss. W. Pennsylv. 287. 1913.
Hypnum luridum Hedw., Spec. Musc. 291. 1801.
[Synonym: *H. palustre* Loeske]
PLATE 296

Plants with small, often falcate-secund, entire leaves, 1.0–1.5 mm long, and usually strong, single or sometimes double costae, reaching to leaf middle or beyond.

Habitat: On wet rocks, in and beside creeks and streams.

Maritime Distribution: Frequent. New Brunswick (Albert, Queen's, Restigouche, Saint John, Victoria); Nova Scotia (Kings, Victoria).

Range: Labrador to Alaska, south to *Pennsylvania, Michigan, Colorado, Utah, and Oregon. Europe, *Asia.

Chromosome Number: n = 10, 11.

4. **Hygrohypnum eugyrium** (B.S.G.) Loeske, Verh. Bot. Ver. Brandenburg 46: 198. 1905.
Limnobium eugyrium B.S.G., Bryol. Eur. 6: 73. 579. 1855 (fasc. 62–64 Mon. Suppl. 1).
[Synonym: *Hypnum eugyrium* var. *mackayi* Schimp.]
PLATE 297

Plants with lanceolate to ovate-lanceolate, erect-spreading leaves, 1.0–1.5 mm long, margins entire, sometimes denticulate at apices, and weak, double costae ending below the leaf middle.

Habitat: On rocks, boulders, wet cliffs, in and beside creeks and rivers.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Queen's, Victoria); Nova Scotia (Annapolis, Colchester, Guysborough, Halifax, Inverness, Kings, Lunenburg, Victoria).

Range: Greenland to Ontario, south to North Carolina, Tennessee, Ohio, and Michigan. Europe, *Asia.

Chromosome Number: n = 8.

Remarks: *Hygrohypnum subeugyrium* (Ren. & Card.) Broth., which is known nearby in Newfoundland and has been reported from New Brunswick (see Excluded Taxa), is very similar to *H. eugyrium*. Its leaves are described as less concave with margins less infolded above and with fewer enlarged alar cells than in *H. eugyrium*. A Nova Scotia report (Ireland *et al*, 1980) is a typographical error.

5. **Hygrohypnum bestii** (Ren. & Bryhn *ex* Ren.) Holz. *ex* Broth., Nat. Pfl. 1(3): 1040. 1908.
Hypnum molle ssp. *bestii* Ren. & Bryhn *ex* Ren., Bull. Ac. Int. Geogr. Bot. 10: 7. 1901.
PLATE 298

Plants with large, erect- to wide-spreading leaves that clasp the stems, 1.5–3.5 mm long, and strong, double or sometimes single costae, reaching to the leaf middle or beyond.

Habitat: On boulders in creek and on face of waterfall.

Maritime Distribution: Rare. Nova Scotia (Victoria). Collected in Aspy River, 8 July 1954 (*Schofield 4890*, CANM, NSPM), and in Big Intervale, Aspy Trail, Beulach Ban, 26 July 1950 (*Erskine 50C1486*, NSPM).

Range: Endemic to North America, from Alaska to Alberta, south to South Dakota, Colorado, Utah, and California; also in Nova Scotia, *New Brunswick, and Quebec.

Chromosome Number: Unreported.

Remarks: Crum and Anderson (1981) do not confirm the presence of *H. bestii* in eastern North America but instead consider most plants so named *H. molle* (Hedw.) Loeske.

6. Hygrohypnum duriusculum (De Not.) Jamieson, Taxon 29: 152. 1980.
Limnobium duriusculum De Not., Erb. Critt. Ital. ser. 2: n. 204. 1869.
[Synonym: *Hygrohypnum dilatatum* (Wils. *ex* Schimp.) Loeske]
PLATE 299

Plants with wide-spreading, ovate to suborbicular leaves, 1–2 mm long, about as broad as long, and weak, double costae ending below the leaf middle or sometimes lacking.

Habitat: On rocks and boulders in creeks and occasionally on wet seepy banks.

Maritime Distribution: Frequent. New Brunswick (Albert, Carleton, Queen's, Restigouche, Victoria); Nova Scotia (Digby, Guysborough, Halifax, Inverness, Victoria).

Range: Labrador to Quebec, south to Massachusetts, Tennessee, and Minnesota; also in British Columbia and Colorado. Europe, *Asia.

Chromosome Number: n = 11.

Remarks: Crum and Anderson (1981) consider this species inseparable from *H. molle* (Hedw.) Loeske.

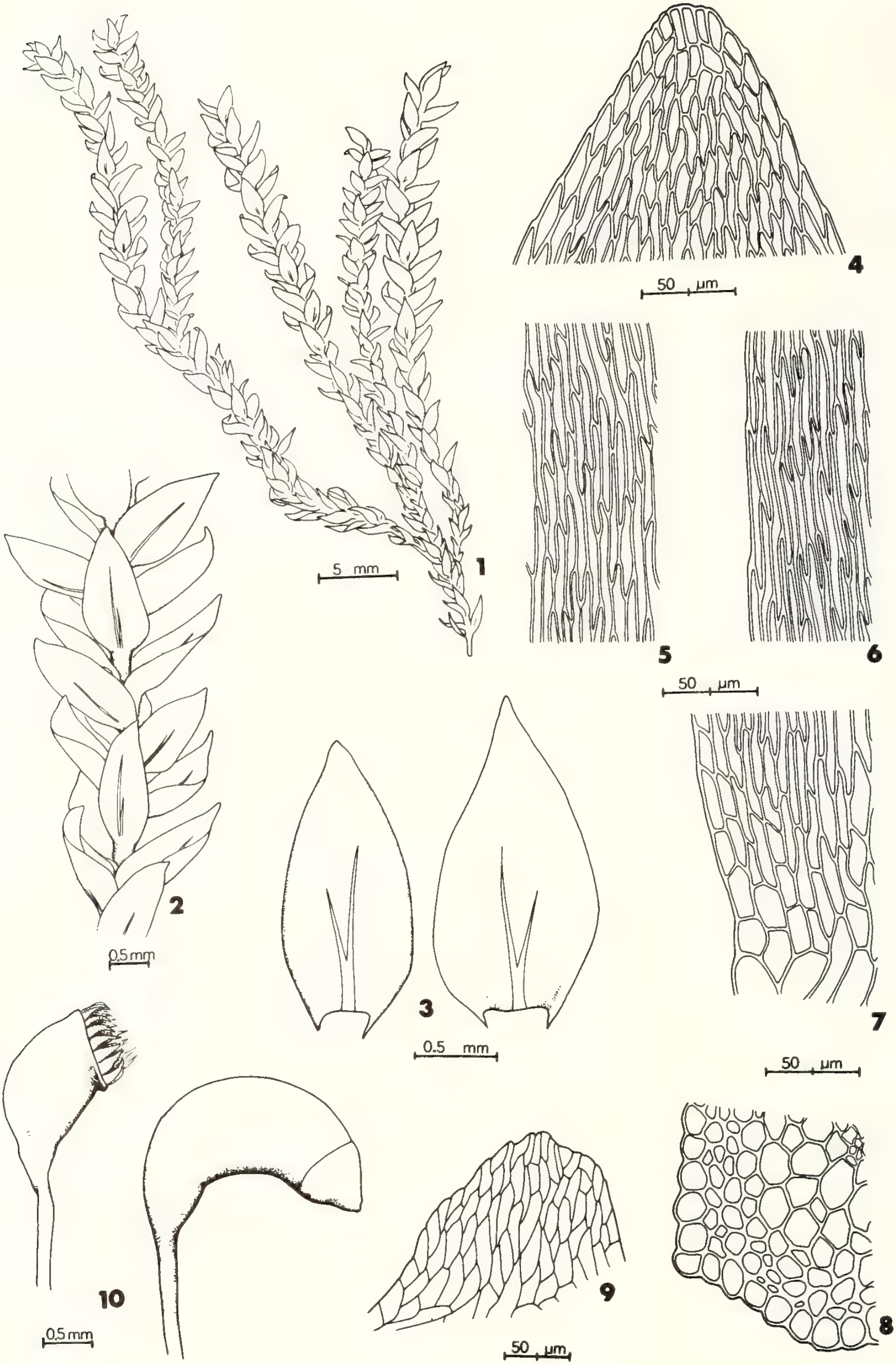
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Plate 294. *Hygrohypnum ochraceum* 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Pseudoparaphyllium. 10. Capsules, operculate (wet), inoperculate (dry).

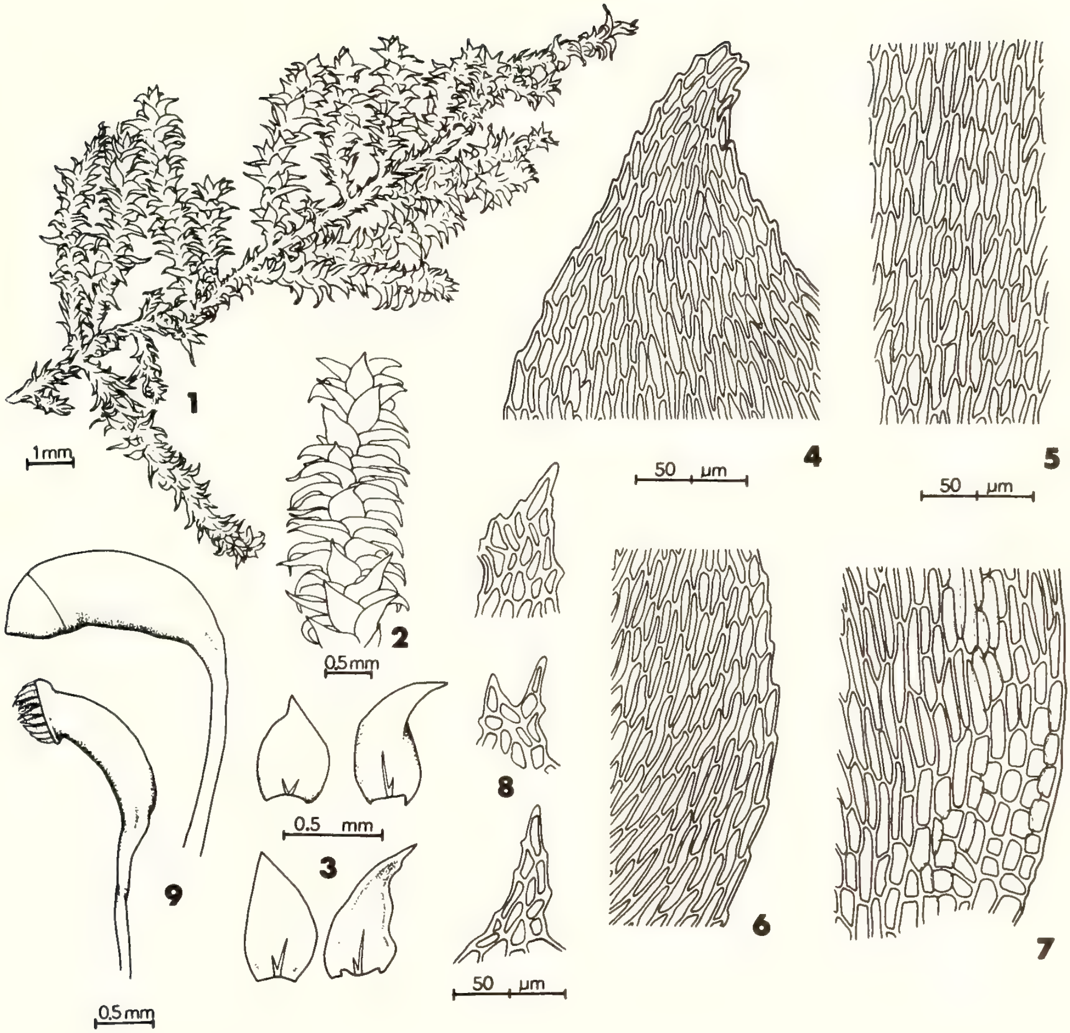
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Plate 295. *Hygrohypnum montanum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Capsules, operculate (wet), inoperculate (dry).

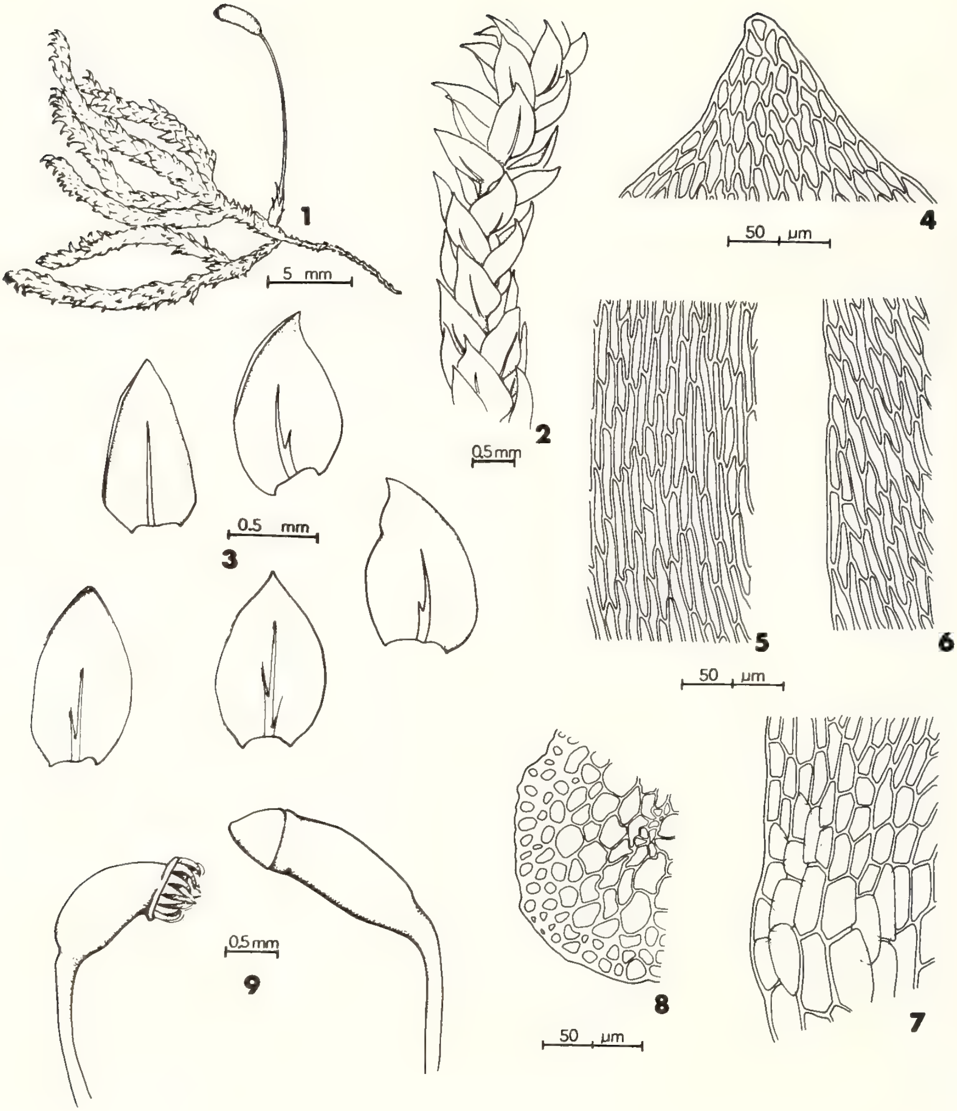
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Plate 296. *Hygrohypnum luridum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry).

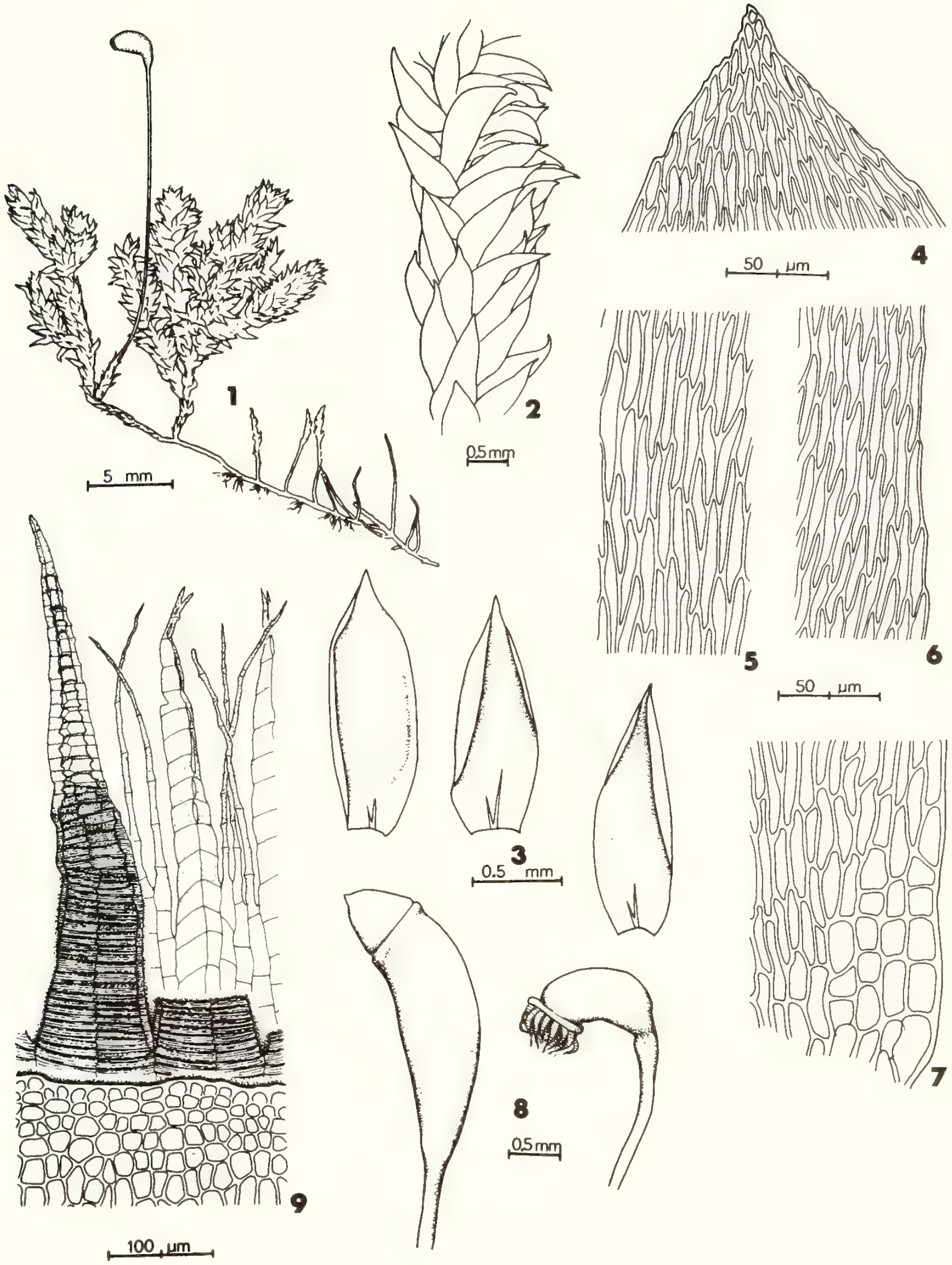
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Plate 297. *Hygrohypnum eugyrium*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome teeth.

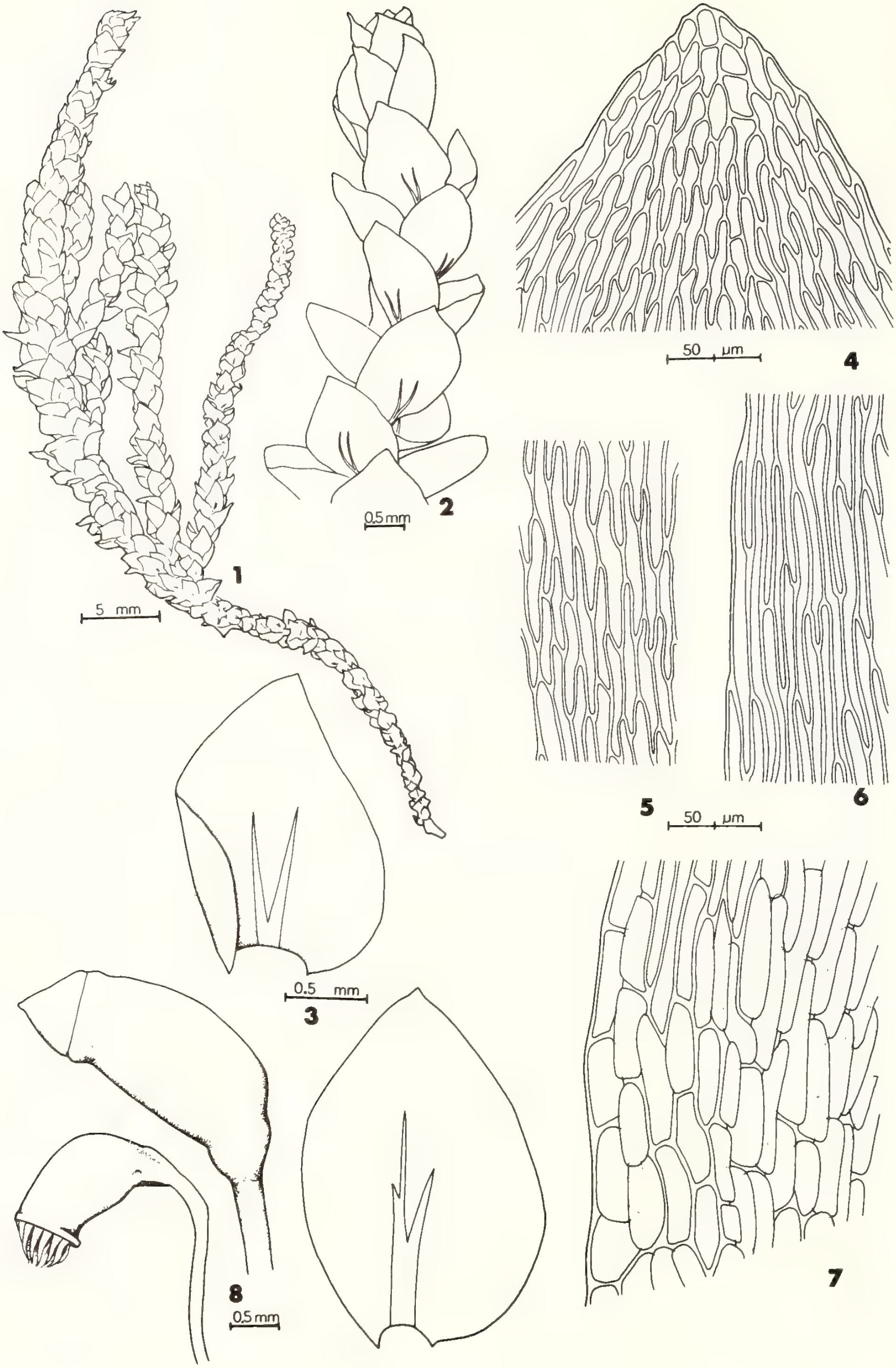
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Plate 298. *Hygrohypnum bestii*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

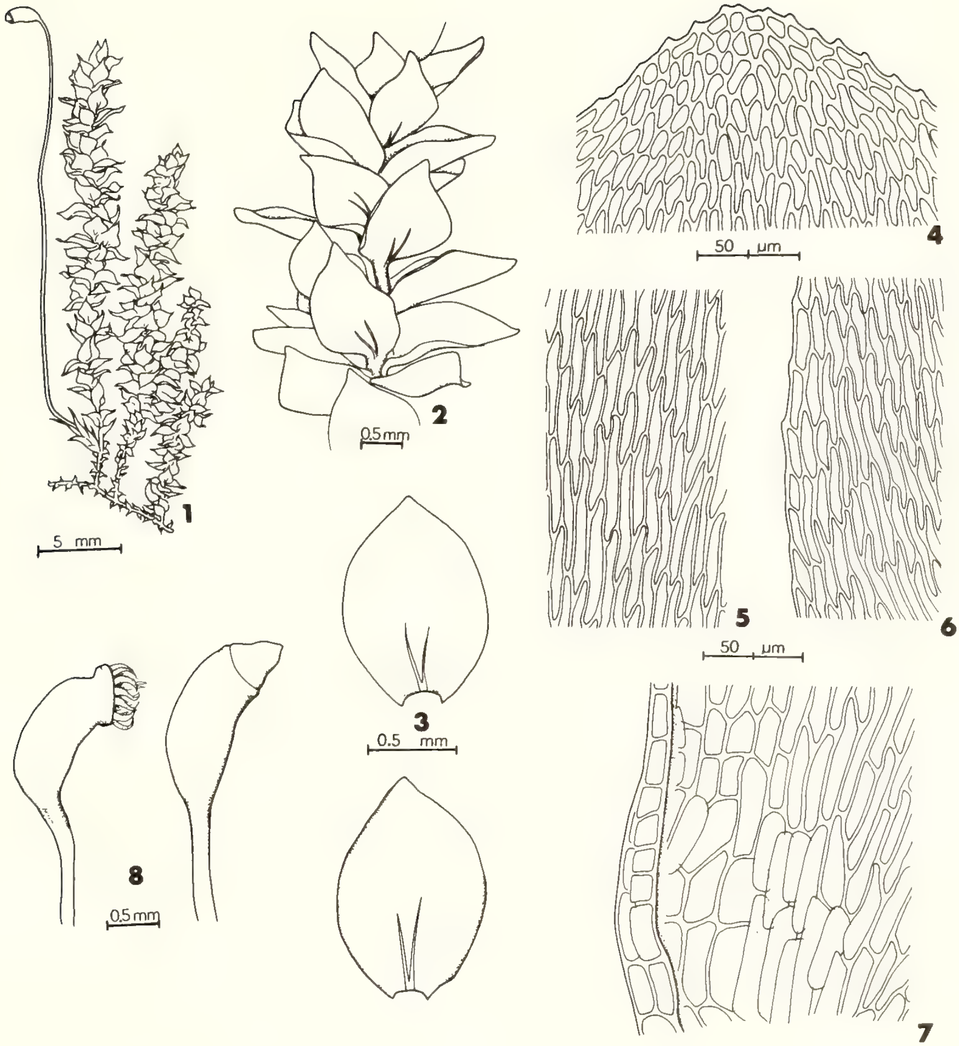
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Plate 299. *Hygrohypnum duriusculum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry).

10. **Scorpidium** (Schimp.) Limpr., Laubm. Deutschl. 3: 570. 1899.
Hypnum subg. *Scorpidium* Schimp., Syn. 650. 1860.

Habit: Prostrate, in loose mats.

Colour: Green to yellowish, brownish or reddish green, sometimes blackish, glossy.

Stems: 6–15 cm long, prostrate, turgid, irregularly branched, epidermal cells large and thin-walled in cross-section, rhizoids few or lacking. Pseudoparaphyllia lacking.

Leaves: Stem and branch leaves similar, close and imbricate, erect, often falcate-secund, concave, smooth or striate, little changed when dry, broadly oblong to oblong-ovate, obtuse to acute, sometimes apiculate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane or incurved above, entire.

Costae: Short and double, weak, sometimes lacking.

Leaf Cells: Smooth, the walls thin or of medium thickness, basal cells pitted. Median cells fusiform or vermicular, becoming shorter near apex, alar cells often enlarged and inflated.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along base of stems, brown to reddish brown, cylindric, arcuate, inclined, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to flexuose, smooth, slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic, apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 2–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 14–17 μm in longest dimension.

1. Scorpidium scorpioides (Hedw.) Limpr., Laubm. Deutschl. 3: 571. 1899.
Hypnum scorpioides Hedw., Spec. Musc. 295. 1801.
PLATE 300

Plants large, yellowish, brownish or reddish green, stems 6–15 cm long, turgid, irregularly branched, leaves often falcate-secund, oblong-ovate, obtuse to acute, sometimes apiculate, concave, 2–4 mm long, costae weak, short and double or lacking; capsules cylindric, arcuate, 2–3 mm long.

Habitat: A calciphile, occurring in water in fens.

Maritime Distribution: Rare. Nova Scotia (Inverness, Victoria).

Range: Greenland to Alaska, south to *New Jersey, Ohio, Wisconsin, and *Montana. South America, Europe, *Asia.

Chromosome Number: n = 8, 10, 11.

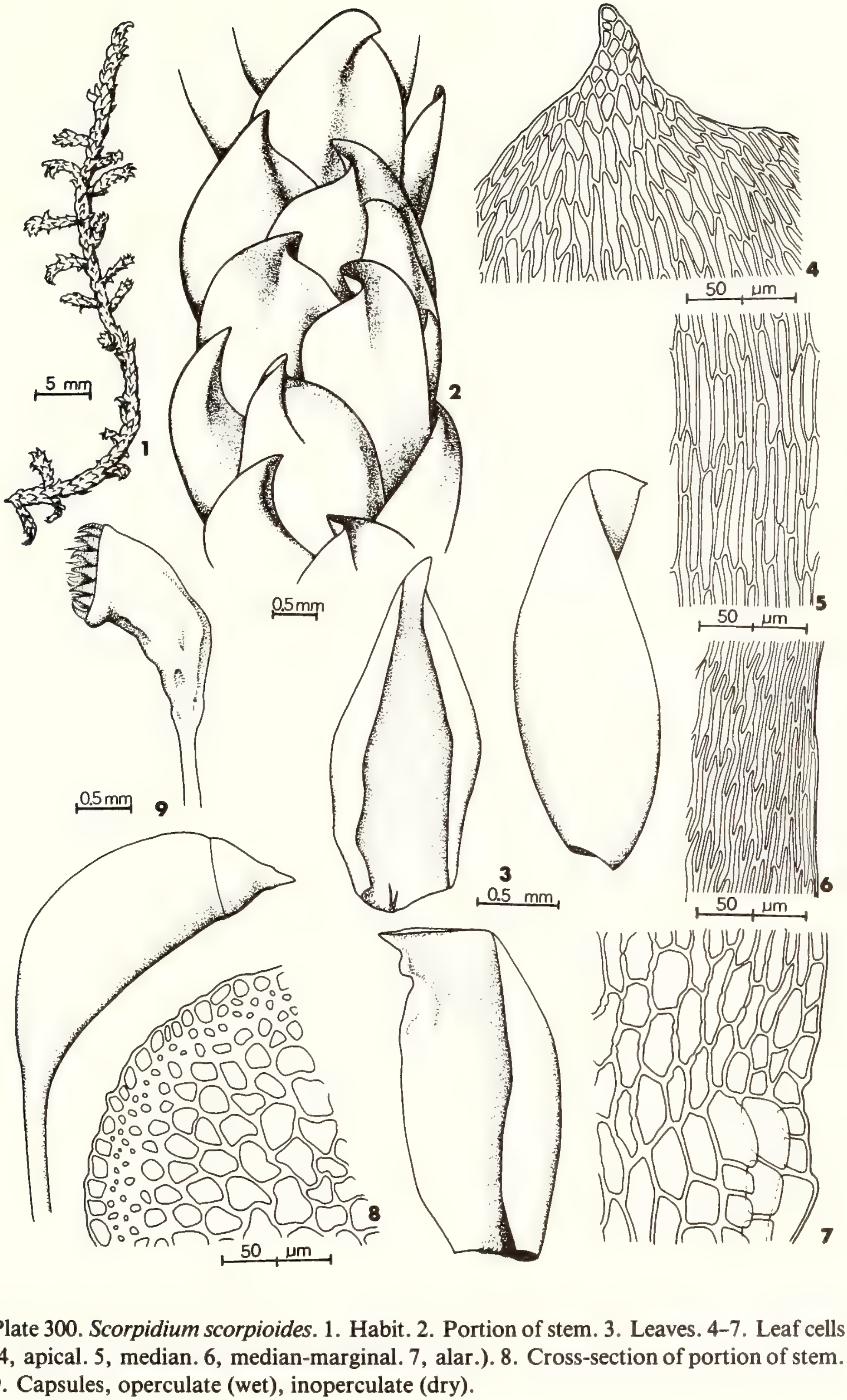
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Plate 300. *Scorpidium scorpioides*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry).

11. Calliergon (Sull.) Kindb., Canad. Rec. Sci. 6(2): 72. 1894.
Hypnum sect. *Calliergon* Sull., Man. Bot. No. U.S. ed. 2: 672. 1856.

Habit: Erect to prostrate, in loose to dense tufts or mats.

Colour: Green to yellowish or brownish green, often glossy.

Stems: 4–15 cm long, erect or prostrate, sometimes julaceous, simple or branched, sometimes pinnately branched, epidermal cells small and thick-walled in cross-section, stems and branches often cuspidate at apices, rhizoids smooth or minutely papillose, sparse, between the leaves at base of stems. Pseudoparaphyllia foliose, often deeply incised.

Leaves: Stem and branch leaves similar, distant to close and imbricate, erect to wide-spreading, concave, often cucullate at apices, somewhat twisted and contorted when dry, sometimes striate, ovate, elliptic, orbicular or cordate, broadly rounded-obtuse to apiculate, decurrent, rhizoids smooth or minutely papillose, sometimes on dorsal surface near apices. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane or somewhat inrolled, entire or minutely serrulate at apex.

Costae: Single, extending 3/4 the leaf length or subpercurrent to percurrent, slightly prominent on dorsal surface.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits or basal cells sometimes pitted. Median cells fusiform to vermicular, a small group near apex often enlarged, becoming shorter and broader near base, quadrate, rectangular or hexagonal, alar cells often abruptly inflated.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous (*C. cordifolium*) or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along base of stems, light brown to reddish brown, oblong-cylindric to oblong-ovoid, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, light brown to reddish brown.

Annuli: Lacking in Maritime species.

Opercula: Conic, apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 2–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose, smooth to minutely papillose, 9–19 μm.

1. Leaves appressed, close throughout the stems; costae short, reaching 3/4 the length of the leaves . . . . 3. *C. stramineum*
1. Leaves spreading, close only at apices of stems and branches; costae long, subpercurrent to percurrent 2
    2. Plants with numerous branches, often pinnate; stem leaves broad, sometimes nearly as broad as long, alar cells abruptly inflated; dioicous . . . . 2. *C. giganteum*
    2. Plants irregularly branched with few branches; stem leaves narrow, clearly longer than broad, alar cells gradually enlarged; autoicous . . . . 1. *C. cordifolium*

1. Calliergon cordifolium (Hedw.) Kindb., Canad. Rec. Sci. 6(2): 72. 1894.
Hypnum cordifolium Hedw., Spec. Musc. 254. 1801.
PLATE 301

Plants autoicous, slender to robust, stems with few branches, branching irregular, leaves clearly longer than broad, not crowded, spreading, alar cells numerous, gradually enlarged, costae single, subpercurrent to percurrent.

Habitat: In bogs, swamps, drainage ditches and wet depressions.

Maritime Distribution: Common. New Brunswick (Charlotte, Victoria, York); Nova Scotia (Cape Breton, Halifax, Hants, Inverness, Queens, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: *Greenland to Alaska, south to New York, Pennsylvania, Illinois, Minnesota, Colorado, Idaho, and Washington. Europe, Asia, *New Zealand.

Chromosome Number: n = 10, 21, 22.

2. Calliergon giganteum (Schimp.) Kindb., Canad. Rec. Sci. 6(2): 72. 1894.
Hypnum giganteum Schimp., Syn. 642. 1860.
[Synonym: *Calliergon giganteum* var. *cyclophyllotum* (Holz.) Grout]
PLATE 302

Plants dioicous, usually robust, stems with numerous branches, often pinnate, leaves nearly as broad as long, not crowded, spreading, alar cells numerous, abruptly inflated and forming auricles, costae single, subpercurrent to percurrent..

Habitat: In bogs, shallow pools, ponds and near springs.

Maritime Distribution: Rare. New Brunswick (Madawaska, Queen's); Nova Scotia (Victoria); Prince Edward Island (Kings, Prince).

Range: Greenland to Alaska, south to New York, Pennsylvania, Michigan, Minnesota, *Colorado, and Washington. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: *Calliergon giganteum* is a species of great variability throughout the world. Karczmarz (1971), who monographed the genus, identified a specimen from P.E.I. as the var. *cyclophyllotum* (Tignish, *Macoun*, 26 July 1888, CANM *176400*) but I believe the variety, which differs from typical var. *giganteum* by its squamose, appressed stem leaves, is not worth taxonomic segregation.

3. Calliergon stramineum (Brid.) Kindb., Canad. Rec. Sci. 6(2): 72. 1894.
Hypnum stramineum Brid., Musc. Rec. 2(2): 172. 1801.
[Synonym: *Calliergon stramineum* var. *patens* (Lindb.) Roth]
PLATE 303

Plants dioicous, slender, stems often julaceous, simple or sparingly branched, leaves longer than wide, close, imbricate, cells in alar region inflated, few, costae single, reaching $^3/_4$ the length of the leaves.

Habitat: In bogs, at margin of lakes, in shallow pools and on boulders beside rivers.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Queen's, Saint John, Victoria); Nova Scotia (Colchester, Cumberland, Halifax, Inverness, Lunenburg, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to New York, Michigan, Wisconsin, Colorado, Montana, and *Oregon. *South America, Europe, Asia.

Chromosome Number: $n = 11$.

Remarks: Reddish brown rhizoids sometimes occur on the dorsal surface of the leaf tips.

Karczmarz (1971) named a specimen from P.E.I. the var. *patens* (Otter Pond, *Macoun*, 30 June 1888, CANM *176732*) but the variety differs from var. *stramineum* only by having the leaves erect-spreading rather than appressed. I prefer to include the var. *patens* in synonomy with the typical variety.

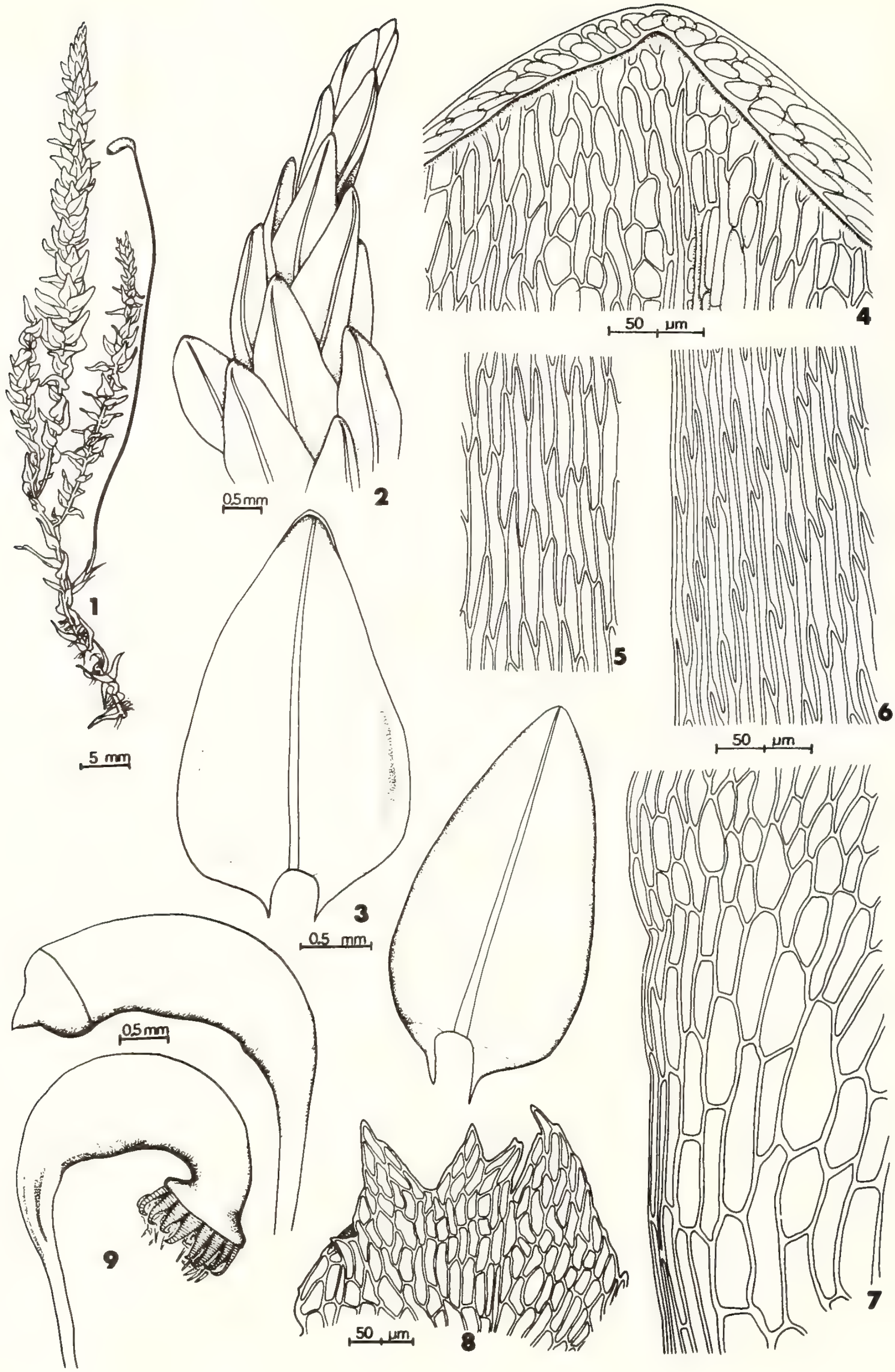
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Plate 301. *Calliergon cordifolium*. 1. Habit. 2. Portion of stem. 3. Stem leaves. 4–7. Cells of stem leaf (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllium. 9. Capsules, operculate (wet), inoperculate (dry).

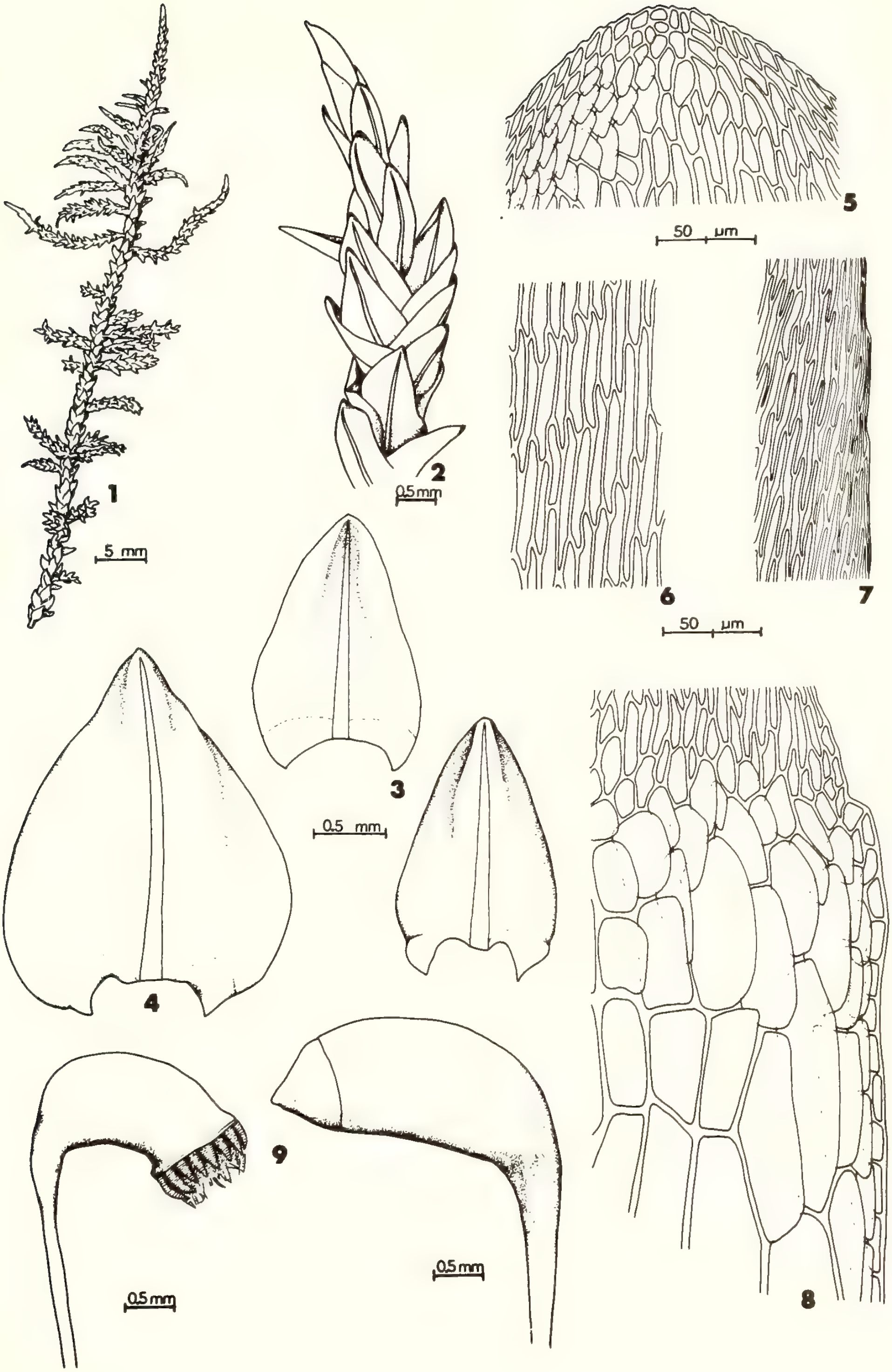
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Plate 302. *Calliergon giganteum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaf. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

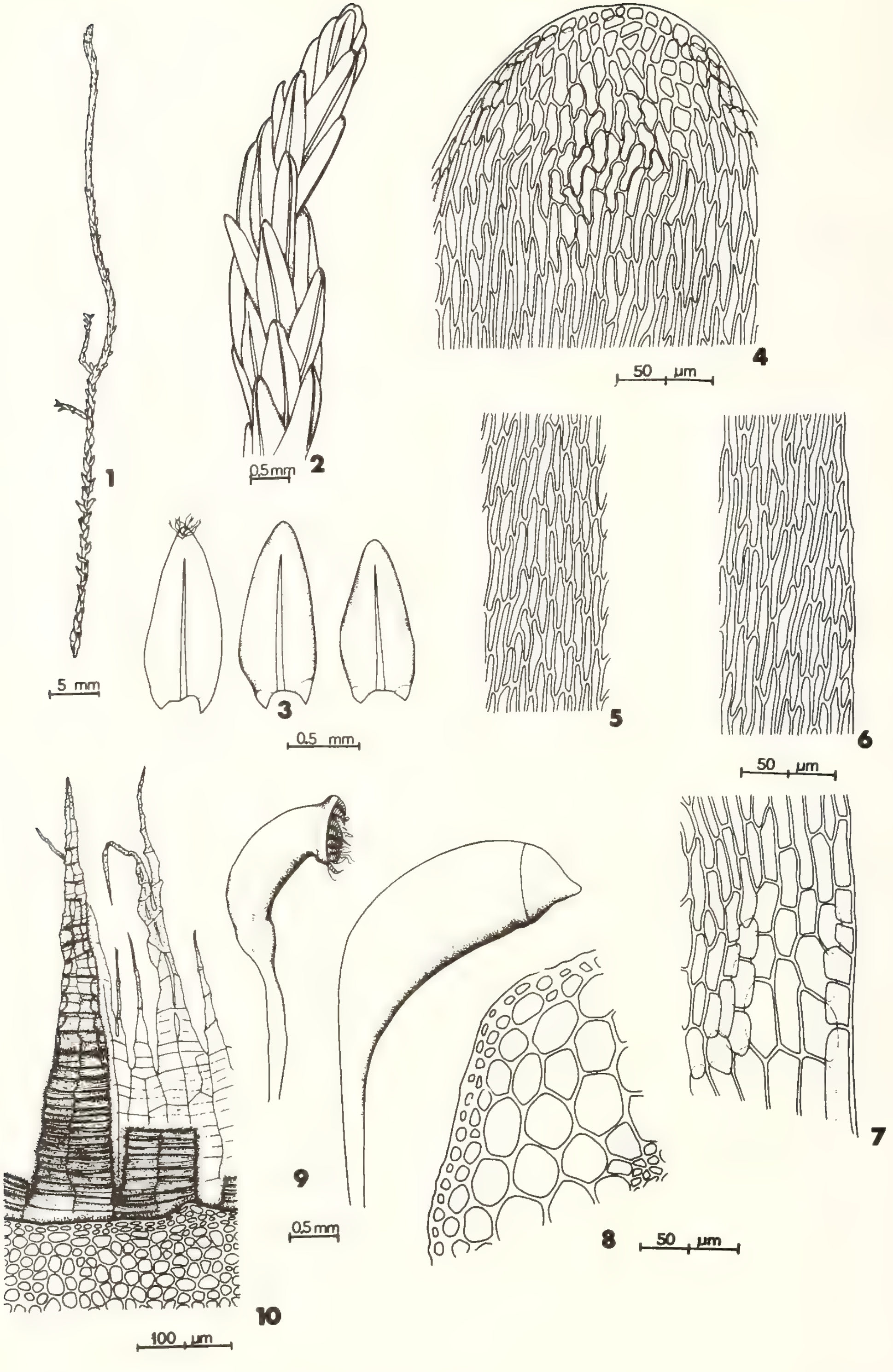
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Plate 303. *Calliergon stramineum*. 1. Habit. 2. Portion of stem. 3. Stem leaves (leaf on left with rhizoids near apex). 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry). 10. Peristome teeth.

12. **Calliergonella** Loeske, Hedwigia 50: 248. 1911.

Habit: Ascending to erect, in loose tufts or mats.

Colour: Green to yellowish green, becoming brownish green with age, glossy.

Stems: 5–10 cm long, ascending or erect, subpinnately to pinnately branched, epidermal cells large and thin-walled in cross-section, stems and branches cuspidate at apices, rhizoids lacking. Pseudoparaphyllia foliose, orbicular.

Leaves: Close, imbricate, erect to erect-spreading, concave, somewhat contorted when dry, smooth, decurrent, stem leaves oblong-ovate to elliptic, apices rounded with a minute apiculus, branch leaves smaller, oblong to oblong-lanceolate, usually narrower at apices. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Inrolled, entire or with a few minute serrulations at leaf apices.

Costae: Lacking or short and double, extending a few cells above leaf base.

Leaf Cells: Smooth, the walls thin or of medium thickness, basal cells pitted. Median cells fusiform to vermicular, becoming shorter and broader near apex and base, alar cells quadrate or rectangular, abruptly inflated.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Sporophytes not seen from the Maritimes.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along base of stems, light brown to reddish brown, oblong-ovoid, arcuate, horizontal to cernuous, smooth, wrinkled at neck and sometimes contracted under mouth when dry.

Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, light brown to reddish brown.

Annuli: 2–4 rows of large cells, deciduous.

Opercula: Conic, apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 3–4 cilia, nodulose.

Spores: Yellow to yellowish brown, globose, minutely papillose, 12–20 μm.

1. **Calliergonella cuspidata** (Hedw.) Loeske, Hedwigia 50: 248. 1911.
Hypnum cuspidatum Hedw., Spec. Musc. 254. 1801.
[Synonym: *Acrocladium cuspidatum* (Hedw.) Lindb.]
PLATE 304

Plants yellowish green, stems 5–10 cm long, subpinnately to pinnately branched, with stem and branch tips cuspidate. In many ways resembling a *Calliergon* or *Pleurozium* but the short and double costa, that is sometimes lacking, and the apiculate leaves will distinguish it from a *Calliergon*, while the yellowish green colour of the upper part of the stems will immediately distinguish it from the all red-stemmed *Pleurozium*.

Habitat: A calciphile occurring in swamps, rich fens, and alkaline bogs.

Maritime Distribution: Common. New Brunswick (Queen's); Nova Scotia (Antigonish, Cape Breton, Colchester, Halifax, Hants, Inverness, Kings, Victoria, Yarmouth); Prince Edward Island (Prince, Queens).

Range: Newfoundland to Alaska, south to New Jersey, Tennessee, Iowa, Wyoming, Idaho, and California. West Indies, *South America, Europe, Asia, *Australia, New Zealand.

Chromosome Number: n = 11, 12.

Remarks: The plants rarely produce sporophytes in North America and none of the Maritime plants seen were fruiting. The drawings of the sporophyte were made from European plants.

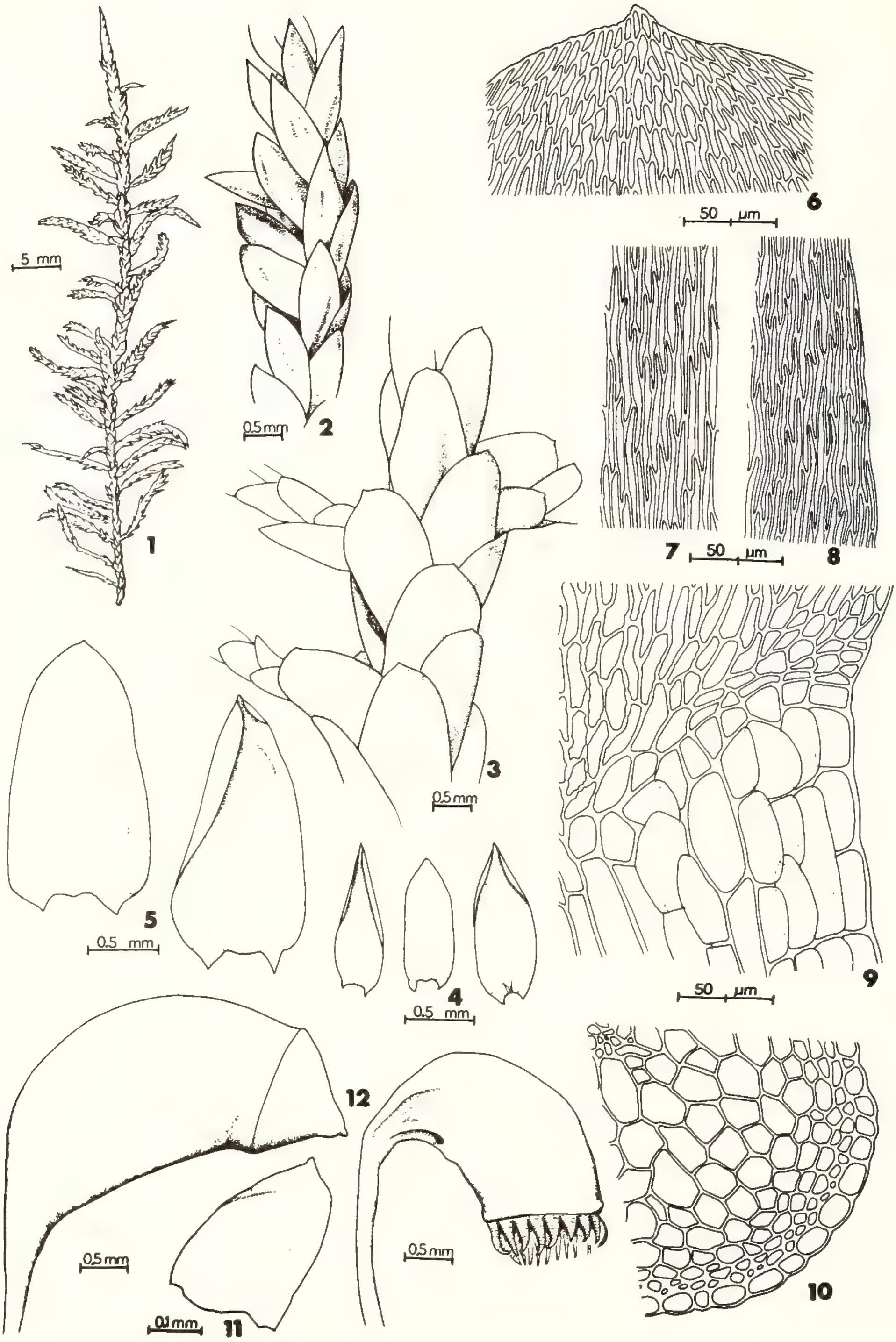
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Plate 304. *Calliergonella cuspidata*. 1. Habit. 2. Portion of branch. 3. Portion of stem. 4. Branch leaves. 5. Stem leaves. 6–9. Cells of stem leaf (6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Cross-section of portion of stem. 11. Pseudoparaphyllium. 12. Capsules, operculate (wet), inoperculate (dry).

Family BRACHYTHECIACEAE

1. Stems erect, appearing tomentose; leaves pluriplicate, costae with numerous rhizoids on dorsal surface .... 1. *Tomenthypnum* (p. 535)
1. Stems prostrate to ascending, not tomentose; leaves smooth or plicate, costae lacking rhizoids on dorsal surface 2
    2. Leaves strongly concave, abruptly narrowed to filiform acumen .. 5. *Cirriphyllum* (p. 566)
    2. Leaves not concave and abruptly narrowed to filiform acumen 3
        3. Leaves small, mostly 1 mm or less long; cylindrical gemmae often present on dorsal surface of costae near apex; pseudoparaphyllia present, small, foliose to filamentous .... 6. *Conardia* (p. 568)
        3. Leaves larger, mostly 1 mm or more long; gemmae lacking; pseudoparaphyllia lacking or large and foliose 4
            4. Median leaf cells often prorate on dorsal surface; setae rough .... 4. *Bryhnia* (p. 562)
            4. Median leaf cells smooth; setae rough or smooth 5
                5. Alar cells thick-walled, round, quadrate or short-rectangular .... 2. *Isothecium* (p. 538)
                5. Alar cells often thin-walled, quadrate to long-rectangular 6
                    6. Costae smooth on dorsal surface; opercula conic to short-rostrate .... 3. *Brachythecium* (p. 540)
                    6. Costae ending in a spine on dorsal surface; opercula long-rostrate 7
                        7. Stems with few branches, irregularly branched; stem leaves nondecurrent or short-decurrent .... 7. *Eurhynchium* (p. 570)
                        7. Stems with numerous branches, subpinnate; stem leaves long-decurrent .... 8. *Stokesiella* (p. 575)

1. **Tomenthypnum** Loeske, Deutschl. Bot. Monatschr. 20: 82. 1911. ["-typnum"].

Habit: Erect, in loose to dense tufts.
Colour: Yellowish to yellowish brown, glossy, with reddish brown rhizoids.
Stems: 5–10 cm long, erect, regularly branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth or papillose, sometimes present at juncture of leaves. Pseudoparaphyllia lacking.
Leaves: Stem and branch leaves similar, close, erect-spreading, sometimes secund, scarcely changed when dry, pluriplicate, lanceolate, acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate, plicate.
Leaf Margins: Plane or narrowly recurved, entire, often serrulate at apex, sometimes bistratose at leaf base.
Costae: Single, extending $^3/_4$ or more the leaf length, scarcely prominent on dorsal surface, rhizoids smooth or papillose, numerous, often arising from dorsal surface.
Leaf Cells: Smooth, the walls thick or of medium thickness, pitted. Median cells fusiform to vermicular, alar region poorly differentiated, a few quadrate to rectangular cells present.
Asexual Reproductive Bodies: Lacking.
Sex: Dioicous. Maritime plants unknown with sporophytes.
Calyptrae: Cucullate, naked, yellowish with a reddish tip.
Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted below mouth when dry.
Setae: Straight to somewhat flexuose, smooth, slightly twisted when dry, brown to reddish brown.
Annuli: 2–3 rows of large cells, deciduous.
Opercula: Conic, often apiculate, straight.
Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 2–4 cilia, nodulose.
Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 12–19 μm in longest dimension.

1. **Tomenthypnum nitens** (Hedw.) Loeske, Deutschl. Bot. Monatschr. 20: 82. 1911.
Hypnum nitens Hedw., Spec. Musc. 255. 1801. [Synonyms: *Camptothecium nitens* (Hedw.) Schimp.; *Homalothecium nitens* (Hedw.) Robins.]
PLATE 305

Recognized by the large, yellowish to yellowish brown plants, with erect, regularly branched stems, 5–10 cm high, conspicuously matted with reddish brown tomentum, and by the long-lanceolate, slenderly acuminate, pluriplicate leaves, 3–4 mm long, with rhizoids arising from the dorsal surface of a single costa extending $^3/_4$ or more the leaf length; sporophytes unknown on Maritime plants.

Habitat: In calcareous bogs and swamps.

Maritime Distribution: Frequent. New Brunswick (Queen's, Victoria); Nova Scotia (Halifax, Richmond, Victoria).

Range: Greenland to Alaska, south to New Jersey, *Pennsylvania, Michigan, Wisconsin, Minnesota, Colorado, and Washington. Iceland, Europe, *Asia.

Chromosome Number: n = 10, 12.

Remarks: Another species, *T. falcifolium* (Ren. *ex* Nich.) Tuom., has been reported for New Brunswick (see Excluded Taxa) but no specimens have been seen. Its falcate-secund leaves will easily distinguish it from *T. nitens*. Vitt and Hamilton (1975) discuss the taxonomic status of the species in detail.

Capsules drawn from Alberta plants.

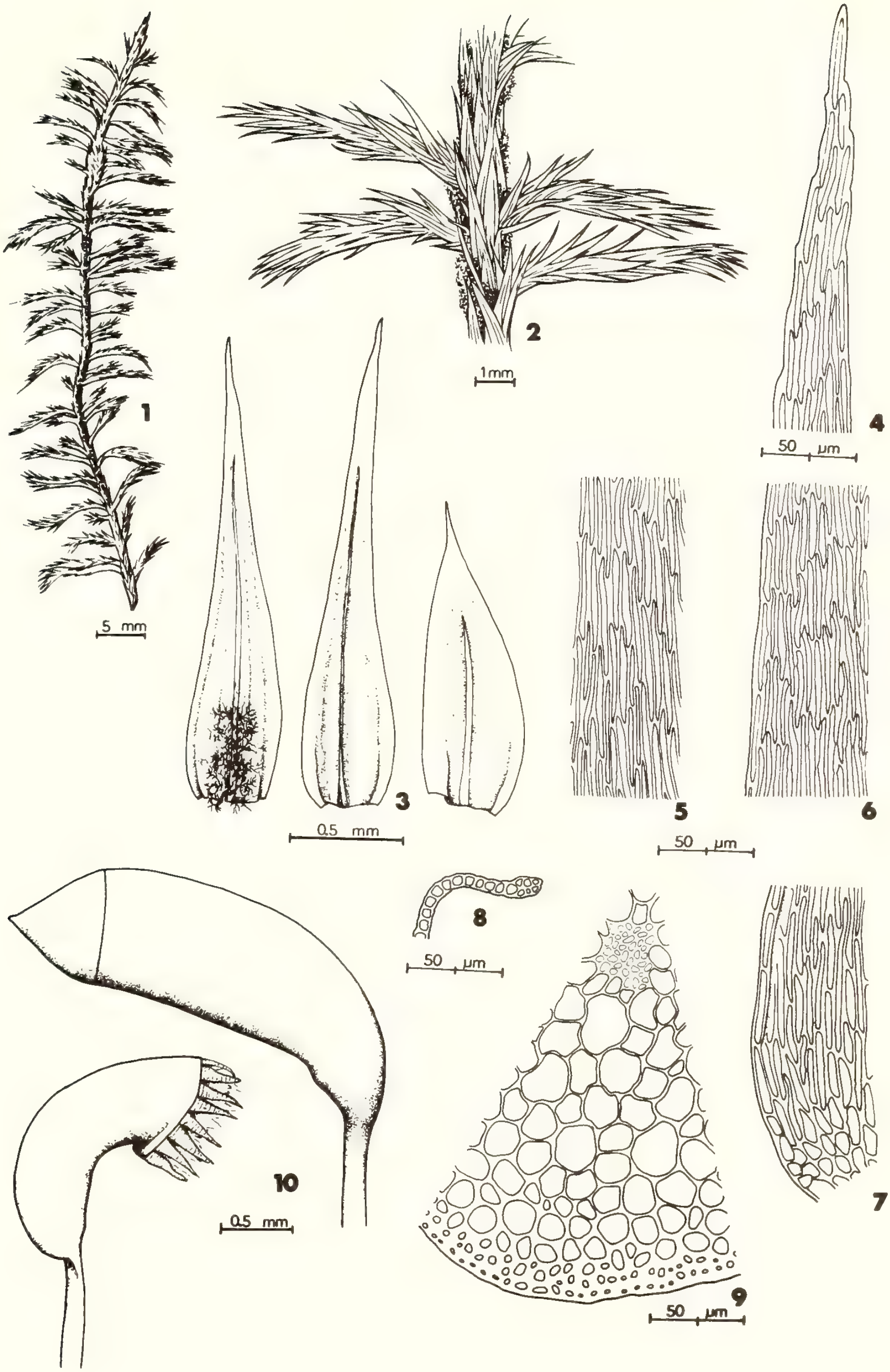
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Plate 305. *Tomenthypnum nitens*. 1. Habit. 2. Portion of stem and branches. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of leaf margin near base. 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

2. **Isothecium** Brid., Bryol. Univ. 2: 355. 1827.

[Synonym: *Pseudisothecium* Grout]

Habit: Prostrate, in loose to dense mats.

Colour: Light green to brownish green, glossy.

Stems: 2–7 cm long, creeping, often stoloniferous, irregularly branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth or papillose, in clusters in leaf axils or just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia lacking.

Leaves: Stem leaves distant, squarrose, scarcely changed when dry, smooth, ovate to cordate-ovate, acuminate, shortly decurrent, branch leaves close, erect-spreading, often twisted at apex, scarcely changed when dry, smooth, ovate- to oblong-lanceolate, acuminate, nondecurrent to shortly decurrent. Perichaetial leaves sheathing base of seta, oblong-lanceolate, long-acuminate, smooth.

Leaf Margins: Plane or narrowly recurved, serrate throughout.

Costae: Single, extending $^1/_2$ or more the leaf length, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, occasionally prorate on dorsal surface near leaf apex, the walls thick or of medium thickness, lacking pits. Median cells fusiform, alar cells round, quadrate, or rectangular, often yellowish or brownish.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems and branches, yellowish brown to orange, oblong-cylindric, straight or weakly arcuate, suberect, smooth, wrinkled at neck when dry.

Setae: Straight to flexuose, smooth, slightly twisted when dry, orange to reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow, endostome hyaline, 2–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, papillose, 12–15 μm in longest dimension.

1. **Isothecium eumyosuroides** Dix., Rev. Bryol. Lichénol. 6: 113. 1934.
[Synonyms: *Eurhynchium myosuroides* (Brid.) Schimp.; *Isothecium myosuroides* Brid.; *Pseudisothecium myosuroides* (Brid.) Grout]
PLATE 306

Plants prostrate, slender, medium-sized, often stoloniferous, stems irregularly branched, 2–7 cm long, leaves 1.0–1.5 mm long, ovate- to oblong-lanceolate, acuminate, smooth, strongly serrate on margins, costae single, extending to middle of leaves or beyond; dioicous, setae smooth, 1–2 cm long, capsules oblong-cylindric, nearly straight, suberect, 1–2 mm long.

Habitat: On shaded boulders, bluffs and rotten stumps.

Maritime Distribution: Frequent. New Brunswick (Charlotte); Nova Scotia (Digby, Halifax, Kings, Lunenburg, Queens, Shelburne, Yarmouth).

Range: Labrador to Ontario, south to North Carolina and Tennessee; also in *British Columbia (?). Europe, *Asia, *Africa.

Chromosome Number: n = 11, 12.

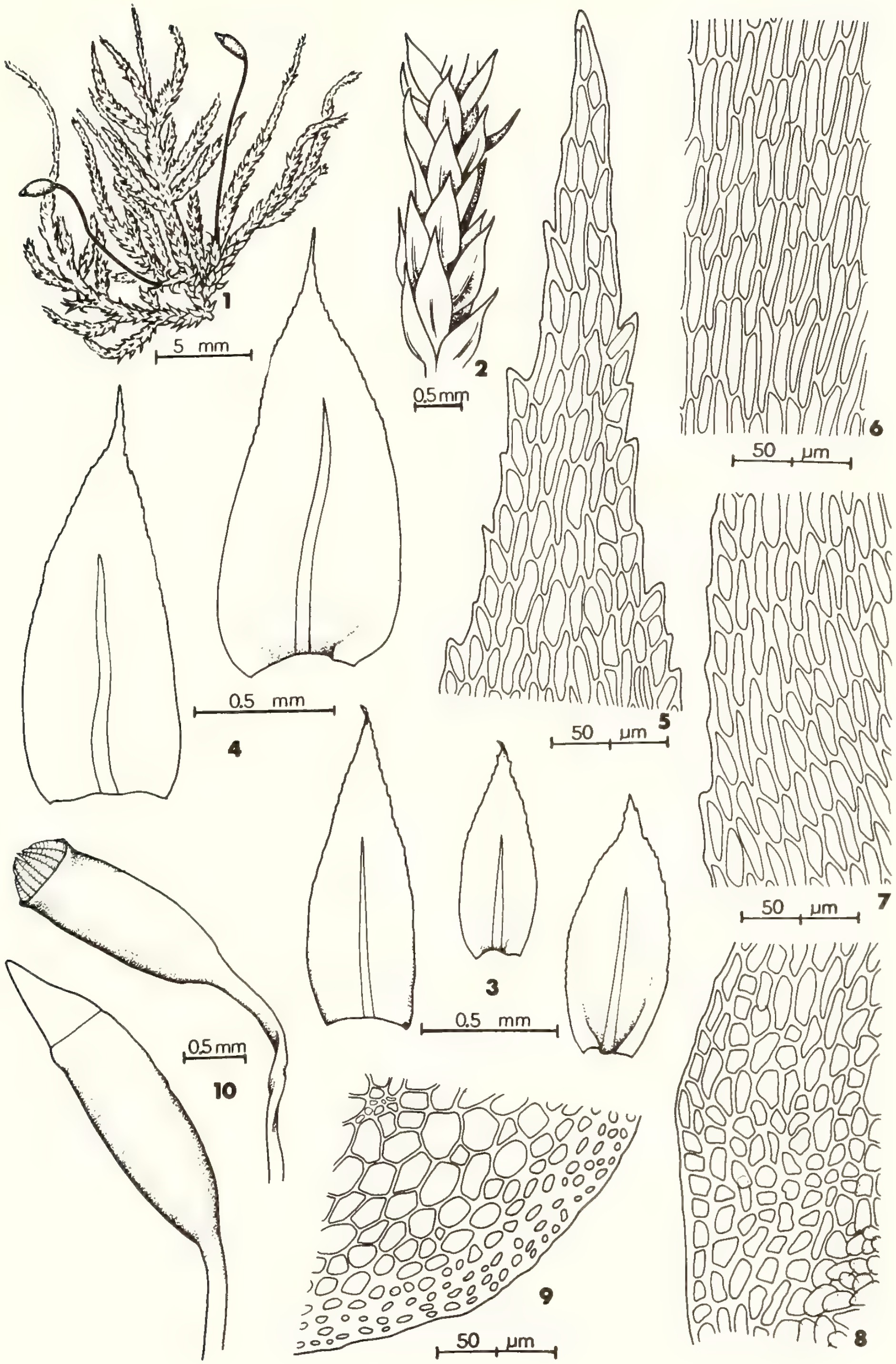
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Plate 306. *Isothecium eumyosuroides*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

3. **Brachythecium** B.S.G., Bryol. Eur. 6: 5. 1853 (fasc. 52–54 Mon. 1).
[Synonym: *Chamberlainia* Grout]

Habit: Prostrate, in loose to dense mats.

Colour: Green, yellowish or whitish green, sometimes brownish green, often glossy.

Stems: 2–10 cm long, creeping to ascending, irregularly to subpinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, orbicular, sometimes lacking.

Leaves: Stem and branch leaves differing somewhat in size and shape, close to distant, concave, smooth to plicate, erect to spreading, straight to falcate, sometimes falcate-secund, somewhat contorted and sometimes crisped and curled when dry, lanceolate, ovate, oblong- or deltoid-ovate, acuminate, rarely acute, often twisted at apex, decurrent. Perichaetial leaves sheathing base of seta, lanceolate, long-acuminate, smooth to plicate.

Leaf Margins: Plane to recurved, serrulate to serrate, sometimes nearly entire below.

Costae: Single, extending 1/2–3/4 the leaf length, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits. Median cells fusiform, vermicular or oblong-rhomboidal, alar cells often enlarged, quadrate or rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, cylindric, oblong-cylindric or oblong-ovoid, straight or arcuate, erect or inclined to horizontal, smooth, contracted below mouth when dry.

Setae: Straight to flexuose, smooth or rough, sometimes only rough above, occasionally twisted when dry, brown to reddish brown.

Annuli: 1–2 rows of large cells, deciduous, rarely lacking.

Opercula: Conic to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome brown to reddish brown, endostome hyaline, 1–3 cilia, nodulose, rarely rudimentary or lacking.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 10–22 μm in longest dimension.

1. Costae extending 3/4 or more the leaf length 2
  2. Leaves mostly 1 mm long or more, stem leaves shortly decurrent, margins entire to serrulate; median leaf cells long, 5–10:1; setae papillose above, smooth below, sometimes smooth throughout . . . . 7. *B. populeum*
  2. Leaves mostly less than 1 mm long, stem leaves long-decurrent, margins serrulate to serrate; median leaf cells short, 3–5:1; setae papillose throughout . . . . 5. *B. reflexum*
1. Costae extending 1/2–2/3 the leaf length 3
  3. Leaf margins entire to serrulate 4
    4. Plants dioicous; leaf margins usually plane above . . . . 8. *B. albicans*
    4. Plants autoicous; leaf margins often recurved to near apices 5
      5. Plants large and turgid, leaves straight, often 3 mm long . . . . . 10. *B. turgidum*
      5. Plants not large and turgid, leaves often falcate, seldom reaching 3 mm long . . . . 12. *B. calcareum* (in part)
  3. Leaf margins serrate to serrulate 6
    6. Leaves smooth 7
      7. Alar regions with numerous enlarged cells, often abruptly inflated and rounded; setae papillose throughout 8
        8. Stem leaves long-decurrent, alar cells round, abruptly inflated; often on boulders in and beside streams . . . . 16. *B. rivulare* (in part)
        8. Stem leaves shortly decurrent or nondecurrent, alar cells quadrate to rectangular, not abruptly inflated; seldom near streams but often in drier habitats in lowland woods 9

9. Stem leaves nondecurrent or nearly so, ovate, apices seldom twisted .... 15. *B. rutabulum* (in part)

9. Stem leaves shortly decurrent, often deltoid, apices twisted .... 2. *B. starkei*

7. Alar regions with few, gradually enlarged cells, quadrate to rectangular, never abruptly inflated; setae papillose throughout or sometimes smooth below 10

10. Leaves falcate, often falcate-secund; setae papillose throughout; on soil or wood in moist to dry lowland woods .... 3. *B. velutinum*

10. Leaves straight or nearly so; setae papillose above, smooth below; on soil or rocks near streams .... 6. *B. plumosum*

6. Leaves plicate 11

11. Stem leaves long-decurrent, alar cells round, abruptly inflated .... 16. *B. rivulare* (in part)

11. Stem leaves shortly decurrent or nondecurrent, alar cells quadrate to rectangular, not abruptly inflated 12

12. Leaves strongly falcate, often falcate-secund 13

13. Leaves on some stems and branches strongly crisped and curled; setae smooth .... 4. *B. erythrorrhizon*

13. Leaves never crisped or curled; setae often papillose .... 14. *B. campestre* (in part)

12. Leaves straight to somewhat falcate 14

14. Plants dioicous 15

15. Stems small, usually less than 1 mm wide, leaves closely imbricate; capsules straight or slightly arcuate, erect .... 1. *B. acuminatum*

15. Stems large, mostly 1 mm wide or more, leaves loosely imbricate; capsules arcuate, inclined .... 11. *B. oxycladon*

14. Plants autoicous 16

16. Setae papillose (at least above) 17

17. Leaves strongly plicate; setae papillose above, sometimes smooth below .... 14. *B. campestre* (in part)

17. Leaves weakly plicate or some smooth; setae papillose throughout .... 15. *B. rutabulum* (in part)

16. Setae smooth 18

18. Plants with filiform leaf apices .... 12. *B. calcareum* (in part)

18. Plants with acute to acuminate leaf apices that are rarely filiform 19

19. Leaves often over 1.5 mm long, apices acuminate .... 9. *B. salebrosum*

19. Leaves 1.5 mm long or less, apices mostly acute .... 13. *B. digastrum*

1. Brachythecium acuminatum (Hedw.) Aust., Musci. Appal. n. 310. 1870.

Leskea acuminata Hedw., Spec. Musc. 224. 1801.

[Synonym: *Chamberlainia acuminata* (Hedw.) Grout]

PLATE 307

Plants small to medium-sized, leaves 1–2 mm long, 0.4–1.0 mm wide, lanceolate to ovate-lanceolate, acuminate, straight to somewhat falcate, plicate, sometimes smooth, margins serrulate to serrate, plane to recurved, stem leaves shortly decurrent, costae single, extending $^{1}/_{2}$–$^{2}/_{3}$ the leaf length; dioicous, setae smooth, 0.7–2.0 cm long, capsules cylindric, straight or slightly arcuate, erect, 1.5–3.0 mm long.

Habitat: On bases of trees and rock.

Maritime Distribution: Rare. New Brunswick (Queen's); Nova Scotia (Digby, Victoria).

Range: Endemic to eastern North America, from Nova Scotia to *Saskatchewan, south to Florida, Louisiana, and Texas.

Chromosome Number: Unreported.

2. **Brachythecium starkei** (Brid.) B.S.G., Bryol. Eur. 6: 14. 541. 1853 (fasc. 52–54 Mon. 10.7).
Hypnum starkei Brid., Musc. Rec. 2(2): 107. 1801.
[Synonyms: *B. curtum* (Lindb.) Limpr.; *B. starkei* var. *curtum* (Lindb.) Warnst.]
PLATE 308

Plants medium-sized to small, somewhat complanate, leaves 1.0–2.5 mm long, 0.4–1.2 mm wide, lanceolate, ovate-lanceolate or deltoid-ovate, acuminate, often twisted at apex, straight to falcate, smooth, margins serrulate to serrate throughout, plane, sometimes recurved below, stem leaves decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; autoicous, setae rough throughout, 1–3 cm long, capsules oblong-ovoid, arcuate, horizontal, 1.5–3.0 mm long.

Habitat: On humus over rock, bases of trees, rotten logs, wet soil and boulders in woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, Northumberland, Queen's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Antigonish, Colchester, Guysborough, Halifax, Hants, Inverness, Kings, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Labrador to British Columbia, south to New Jersey, Ohio, Michigan, Colorado, Arizona, and Washington. Europe, *Asia.

Chromosome Number: n = 10, 20.

Remarks: Most of the Maritime plants are what many bryologists refer to as *B. curtum* (Lindb.) Limpr. This is described as a larger plant with longer median leaf cells (mostly more than 80 μm long). However, there are many intergrades in regard to size and cell length among the Maritime plants which has led me to place *B. curtum* in synonomy with *B. starkei.*

3. **Brachythecium velutinum** (Hedw.) B.S.G., Bryol. Eur. 6: 9. 538. 1853 (fasc. 52–54 Mon. 5.4).
Hypnum velutinum Hedw., Spec. Musc. 272. 1801.
PLATE 309

Plants small, leaves 1–2 mm long, 0.3–0.7 mm wide, lanceolate, acuminate, falcate, often falcate-secund, smooth, margins serrulate to serrate throughout, plane, sometimes recurved below, stem leaves shortly decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; autoicous, setae rough throughout, 0.6–1.5 cm long, capsules oblong-cylindric, arcuate, horizontal, 1.5–2.0 mm long.

Habitat: On soil, often over rock, and bases of trees.

Maritime Distribution: Frequent. New Brunswick (Victoria, York); Nova Scotia (Annapolis, Hants, Inverness, Kings, Queens); Prince Edward Island (Queens).

Range: *Labrador to British Columbia, south to New York, Michigan, Minnesota, Wyoming, Utah, and California. Europe, *Asia, *Africa.

Chromosome Number: n = 10, 11, 12, 18, 20.

4. **Brachythecium erythrorrhizon** B.S.G., Bryol. Eur. 6: 18. 547. 1853 (fasc. 52–54 Mon. 14.13).
PLATE 310

Plants small to medium-sized, leaves 1–2 mm long, 0.3–1.0 mm wide, lanceolate to ovate-lanceolate, long-acuminate, falcate, often falcate-secund, sometimes strongly crisped and curled when dry, plicate, margins entire to serrate, recurved nearly to apex, stem leaves decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; dioicous, Maritime plants sterile, reported to have setae smooth, 1.0–1.7 cm long, capsules oblong-ovoid, arcuate, horizontal, 1.5–2.0 mm long.

Habitat: On rock.

Maritime Distribution: Rare. New Brunswick (Kent, Queen's, Victoria); Prince Edward Island (Queens).

Range: Occurring sporadically in North America where it is known in the East from Newfoundland, Prince Edward Island, New Brunswick, Quebec, and Ontario, and in the West from British Columbia, *Yukon Territory, *Montana, *Wyoming, Colorado, Idaho, *Nevada, Utah, *Washington, and Oregon. Europe, *Asia.

Chromosome Number: Unreported.

Remarks: Capsules drawn from Ontario plants.

5. **Brachythecium reflexum** (Starke *ex* Web. & Mohr) B.S.G., Bryol. Eur. 6: 12. 539. 1853 (fasc. 52–54 Mon. 8.5).
Hypnum reflexum Starke *ex* Web. & Mohr, Bot. Taschenb. 306. 1807.
PLATE 311

Plants small, leaves 0.5–1.0 mm long, 0.3–0.8 mm wide, lanceolate to deltoid-ovate, acuminate, straight, smooth, margins serrulate to serrate throughout, often recurved to leaf middle or above, stem leaves long-decurrent, costae single, extending $^3/_4$ or more the leaf length; autoicous, setae rough throughout, 0.7–1.5 cm long, capsules ovoid, arcuate, inclined to horizontal, 1.0–1.5 mm long.

Habitat: On bases of trees, rotten logs and humus over rocks in mostly dry woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Madawaska, Queen's, Restigouche, Victoria, York); Nova Scotia (Annapolis, Antigonish, Colchester, Digby, Halifax, Inverness, Kings, Victoria); Prince Edward Island (Kings, Queens).

Range: Greenland to Alaska, south to Virginia, Michigan, Wisconsin, Minnesota, and *Oregon. Europe, Asia.

Chromosome Number: n = 10, 11, 20.

6. **Brachythecium plumosum** (Hedw.) B.S.G., Bryol. Eur. 6: 8. 537. 1853 (fasc. 52–54 Mon. 4.3).

Hypnum plumosum Hedw., Spec. Musc. 257. 1801.

PLATE 312

Plants medium-sized, leaves 1–2 mm long, 0.3–1.0 mm wide, lanceolate to ovate-lanceolate, acuminate, straight, smooth, margins entire to serrulate, plane, stem leaves shortly decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; autoicous, setae papillose above, smooth below, 0.7–1.6 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 1–2 mm long.

Habitat: On rock beside streams, rarely on bases of trees and soil.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Queen's, Saint John, Victoria); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria).

Range: Labrador to Alaska, south to *Georgia, Indiana, and Arkansas; also in Arizona and Washington. Mexico, Central America, Europe, Asia, *Africa, New Zealand, Pacific Islands.

Chromosome Number: n = 10, 11.

7. **Brachythecium populeum** (Hedw.) B.S.G., Bryol. Eur. 6: 7. 535. 1853 (fasc. 52–54 Mon. 3.1).

Hypnum populeum Hedw., Spec. Musc. 270. 1801.

PLATE 313

Plants medium-sized, leaves 1–2 mm long, 0.3–0.8 mm wide, lanceolate to ovate-lanceolate, acuminate, straight, weakly plicate when dry, margins serrulate to nearly entire, plane to recurved below, stem leaves shortly decurrent, costae single, extending $^3/_4$ or more the leaf length; autoicous, setae rough above, smooth below, sometimes smooth throughout, 1–2 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 1–2 mm long.

Habitat: Usually on rock or soil over rock, occasionally on bases of trees and rarely on rotten logs.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Restigouche, Victoria, York); Nova Scotia (Annapolis, Colchester, Digby, Inverness, Kings, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Newfoundland to Manitoba, south to Virginia, Ohio, Michigan, and Minnesota; disjunctively occurring in British Columbia and *Alberta. Europe, Asia, *Africa.

Chromosome Number: n = 9, 10, 11.

8. **Brachythecium albicans** (Hedw.) B.S.G., Bryol. Eur. 6: 23. 553. 1853 (fasc. 52-53 Mon. 19.19).

Hypnum albicans Hedw., Spec. Musc. 251. 1801.

PLATE 314

Plants medium-sized, leaves 1.0–2.5 mm long, 0.5–0.8 mm wide, ovate-lanceolate, long-acuminate, straight, plicate when dry, margins entire to finely serrulate, plane or recurved at base, stem leaves shortly decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; dioicous, setae smooth, 1–2 cm long, capsules oblong-ovoid to oblong-cylindric, arcuate, inclined to horizontal, 1.5–2.0 mm long.

Habitat: On grassy ground along roads and on trunks of trees.

Maritime Distribution: Rare. Nova Scotia (Victoria); Prince Edward Island (Queens).

Range: Greenland to Alaska, south to Quebec, Michigan, Colorado, Montana, and California. Europe, *Africa, *New Zealand.

Chromosome Number: n = 6, 7, 9.

9. **Brachythecium salebrosum** (Web. & Mohr) B.S.G., Bryol. Eur. 6: 20. 549. 1853 (fasc. 52–54 Mon. 16.15).

Hypnum salebrosum Web. & Mohr, Bot. Taschenb. 312. 1807.

[Synonyms: *B. acutum* (Mitt.) Sull.; *B. pseudocollinum* Kindb. *ex* Mac. & Kindb.]

PLATE 315

Plants large, leaves 2.0–3.2 mm long, 0.6–1.0

mm wide, lanceolate to ovate-lanceolate, long-acuminate, straight to somewhat falcate, plicate, margins serrulate to serrate, often narrowly recurved, stem leaves shortly decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; autoicous, setae smooth, 1–2 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 2–3 mm long.

Habitat: A weedy species on rock, humus, soil, rotten logs in woods and bases of trees.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Kent, Queen's, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Queens, Shelburne, Victoria); Prince Edward Island (Prince, Queens).

Range: Greenland to Alaska, south to North Carolina, Tennessee, Louisiana, South Dakota, Colorado, Arizona, and California. Mexico, Europe, Asia, *Africa, *Australia, New Zealand.

Chromosome Number: n = 11, 13.

10. **Brachythecium turgidum** (C.J. Hartm.) Kindb., Vid. Medd. Naturh. For. Kjoebenh. ser. 4, 9: 294. 1888.

Hypnum salebrosum var. *turgidum* C.J. Hartm., Handb. Skand. Fl. ed. 3: 309. 1838.

PLATE 316

Plants large, turgid, leaves 2.0–3.5 mm long, 0.7–1.5. mm wide, ovate-lanceolate, long-acuminate, straight, plicate when dry, margins entire to serrulate, recurved to near apex, stem leaves shortly decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; autoicous, Maritime plants sterile, reported to have setae smooth, 1.8–2.5 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 1.8–2.0 mm long.

Habitat: Among grasses at edge of basalt knob in field. Known elsewhere on wet soil and rocks near streams, pools or waterfalls, usually in calcareous habitats.

Maritime Distribution: Rare. Nova Scotia (Kings). Collected once at Black Rock, 21 July 1965, *W.B. Schofield 27478*.

Range: Greenland to Alaska, south to Nova Scotia, Quebec, Ontario, Michigan, Colorado, Montana, and British Columbia.

Chromosome Number: n = 14.

Remarks: Very close to *Brachythecium calcareum* and *B. salebrosum* but the plants are usually much larger and the stems and branches are turgid.

Capsules drawn from Ontario plants.

11. **Brachythecium oxycladon** (Brid.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 322. 1878.

Hypnum oxycladon Brid., Spec. Musc. 2: 123. 1812.

[Synonym: *B. laetum* (Brid.) B.S.G.]

PLATE 317

Plants medium-sized to large, leaves 1.2–2.2 mm long, 0.6–1.2 mm wide, lanceolate to ovate-lanceolate, acuminate, straight to somewhat falcate, plicate, margins serrulate, nearly entire below, often narrowly recurved, stem leaves shortly decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; dioicous, setae smooth, 0.8–2.0 cm long, capsules oblong-cylindric, slightly arcuate, inclined, 2–3 mm long.

Habitat: A weedy species on soil, rocks, rotten wood and bases of trees.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Kent, Queen's, Victoria); Nova Scotia (Colchester, Hants, Yarmouth).

Range: *Labrador to British Columbia, south to North Carolina, Tennessee, Louisiana, Texas, and Arizona. Europe, *South America.

Chromosome Number: Unreported.

12. **Brachythecium calcareum** Kindb., Rev. Bryol. 22: 86. 1895.

[Synonym: *B. flexicaule* Ren. & Card. *ex.* Grout]

PLATE 318

Plants medium-sized, leaves 1.5–3.0 mm long, 0.5–1.0 mm wide, lanceolate to ovate-lanceolate, long-acuminate, usually falcate, plicate when dry, margins serrulate to serrate, nearly entire on stem leaves, recurved to near apex, stem leaves shortly decurrent, costae single, extending $^1/_2$–$^2/_3$ the leaf length; autoicous, setae smooth, 1–2 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 1.5–2.5 mm long.

Habitat: On trunks of trees.

Maritime Distribution: Rare. Nova Scotia (Annapolis). Collected in Hillsdale House, 20 July 1921 (*Fernald, Bartram, Long* and *Fassett 764*. FH).

Range: Endemic to North America, from Labrador to Ontario, south to Quebec, Ohio, Michigan, and Missouri; disjunct in Alaska, Yukon Territory, and *British Columbia.

Chromosome Number: Unreported.

13. **Brachythecium digastrum** C. Müll & Kindb. *ex.* Mac. & Kindb., Cat. Canad. Pl. 6: 190. 1892.

PLATE 319

Plants medium-sized, leaves 1–2 mm long, 0.5–0.8 mm wide, ovate, ovate-lanceolate or oblong-ovate, acute to short-acuminate, straight, plicate, margins serrulate to serrate, usually recurved below, stem leaves shortly decurrent, costae single, extending 1/2–2/3 the leaf length; autoicous, setae smooth, 0.8–1.7 cm long, capsules oblong-cylindric, arcuate, inclined, 1.5–2.5 mm long.

Habitat: On rock in woods.

Maritime Distribution: Rare. New Brunswick (Queen's); Nova Scotia (Inverness).

Range: Endemic to eastern North America, occurring from Nova Scotia to Ontario, south to North Carolina, Tennessee, and Iowa.

Chromosome Number: Unreported.

14. Brachythecium campestre (C. Müll.) B.S.G., Bryol. Eur. 6: 16. 545. 1853 (fasc. 52–54 Mon. 12.11).

Hypnum rutabulum var. *campestre* C. Müll., Syn. 2: 368. 1851.

PLATE 320

Plants medium-sized, leaves 1.5–3.0 mm long, 0.5–1.2 mm wide, lanceolate to ovate-lanceolate, long-acuminate, straight to strongly falcate, plicate, margins serrulate to serrate above, nearly entire below, plane to recurved, stem leaves decurrent, costae single, extending 1/2–2/3 the leaf length; autoicous, setae papillose, sometimes smooth below, 1–2 cm long, capsules oblong-ovoid to oblong-cylindric, arcuate, horizontal, 1.5–3.0 mm long.

Habitat: On rock, humus over rock, soil and bases of trees.

Maritime Distribution: Frequent. New Brunswick (Albert, Kent, Queen's, Victoria, York); Nova Scotia (Inverness, Victoria).

Range: Labrador to Ontario, south to North Carolina, Tennessee, and Iowa; also in Alberta and British Columbia. Europe, Asia, *Africa.

Chromosome Number: n = 11, 12, 17.

15. Brachythecium rutabulum (Hedw.) B.S.G., Bryol. Eur. 6: 15. 543. 1853 (fasc. 52–54 Mon. 11.9).

Hypnum rutabulum Hedw., Spec. Musc. 276. 1801.

PLATE 321

Plants large, leaves 1–3 mm long, 0.5–1.5 mm wide, ovate-lanceolate to ovate, acuminate, straight, smooth to weakly plicate when dry, margins serrulate to serrate above, plane, stem leaves short-decurrent or nondecurrent, costae single, extending 1/2–2/3 the leaf length; autoicous, setae rough throughout, 1.2–3.0 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 2–3 mm long.

Habitat: On bases of trees, humus, rock and soil over rock in moist shady places.

Maritime Distribution: Frequent. New Brunswick (Albert, Carleton, Queen's); Nova Scotia (Annapolis, Digby, Hants, Inverness, Kings, Victoria); Prince Edward Island (Kings).

Range: Labrador to British Columbia, south to North Carolina, *Kentucky, Arkansas, Colorado, Nevada, and California. *Central and *South America, Europe, *Asia, *Africa, *Australia, New Zealand, *Pacific Islands.

Chromosome Number: n = 5, 6, 10, 11, 12, 13, 20, 22.

16. Brachythecium rivulare B.S.G., Bryol. Eur. 6: 17. 546. 1853 (fasc. 52–54 Mon. 13.12).

PLATE 322

Plants large, stems profusely branched from a ± stipitate base, leaves 1–3 mm long, 0.5–1.5 mm wide, ovate-lanceolate to ovate, acute to short-acuminate, straight, smooth to weakly plicate when dry, margins serrulate to serrate above, plane, stem leaves long-decurrent, costae single, extending 1/2–2/3 the leaf length; dioicous, setae rough throughout, 1.2–2.5 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 2–3 mm long.

Habitat: On soil, rocks and logs in and beside creeks, rivers, springs and seepy places.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Queen's, Restigouche, Victoria, Westmorland, York); Nova Scotia (Colchester, Cumberland, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria, Saint Paul Island); Prince Edward Island (Kings, Queens).

Range: Labrador to Alaska, south to North Carolina, Arkansas, Colorado, Arizona, Nevada, and Washington. Europe, Asia, *Africa, *Australia.

Chromosome Number: n = 6, 11, 12, 13.

Remarks: Although *B. rivulare* is sometimes reported to be autoicous the Maritime plants all seem to be dioicous.

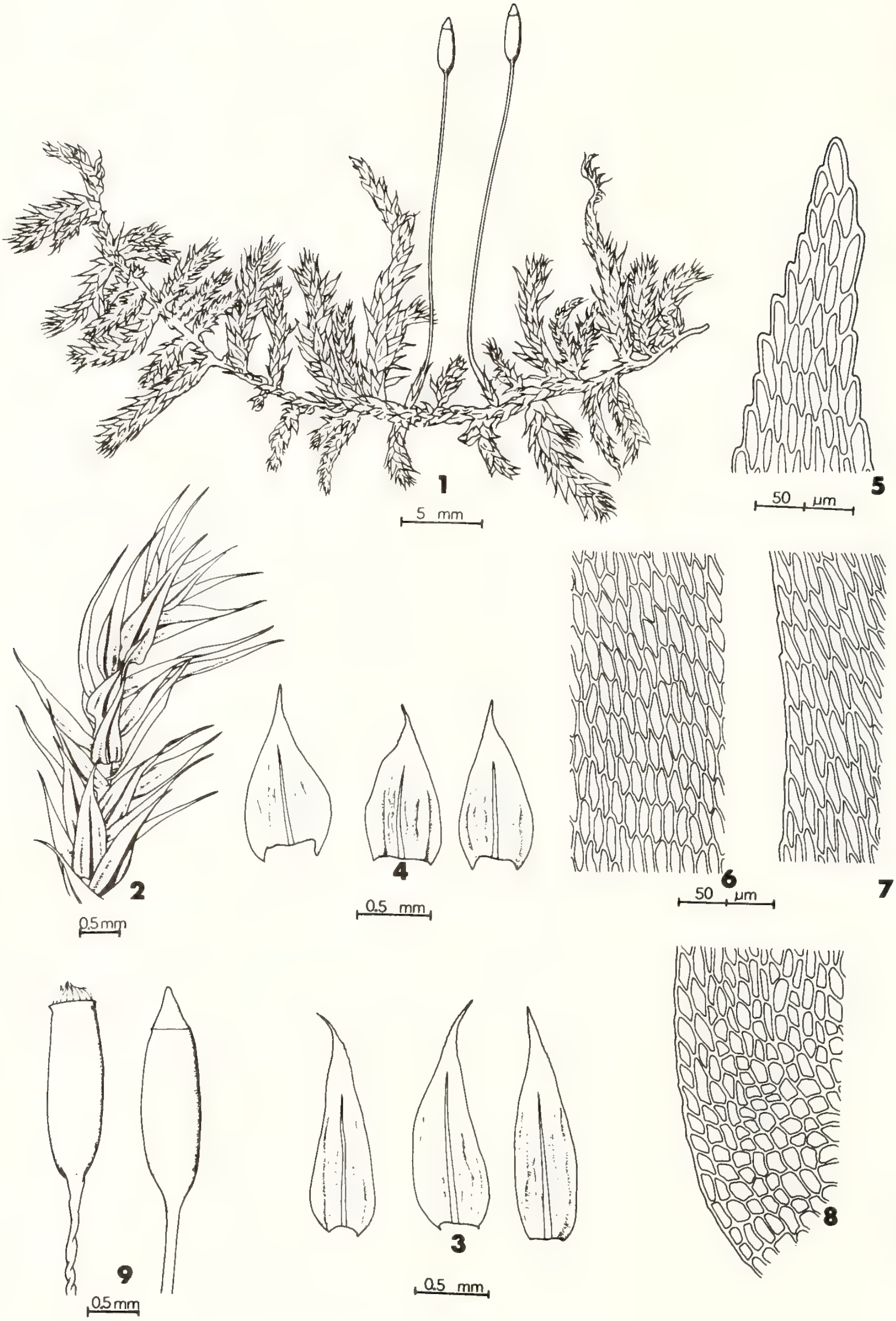
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Plate 307. *Brachythecium acuminatum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

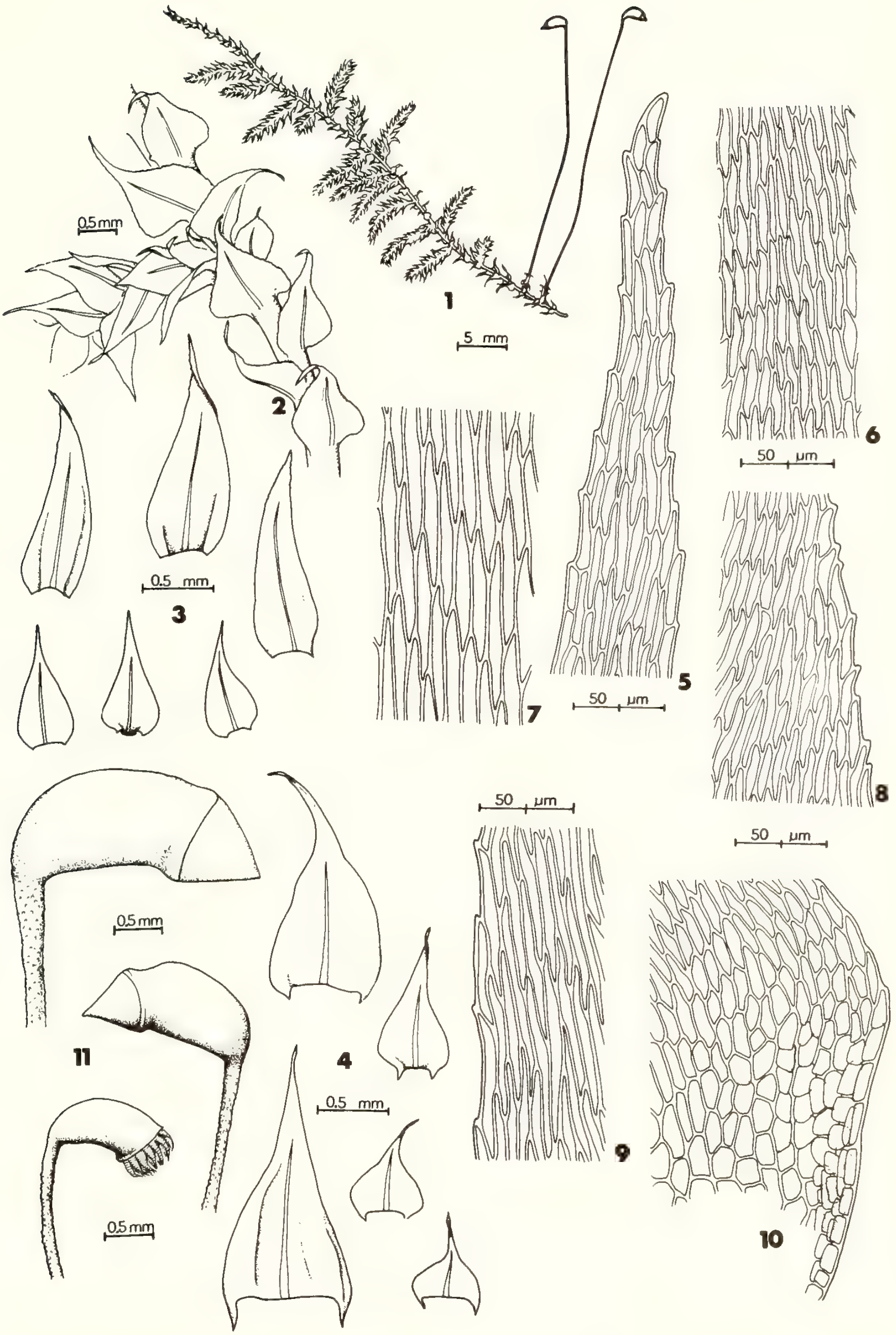
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Plate 308. *Brachythecium starkei*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–10. Cells of stem leaf (5, apical. 6–7, median. 8–9, median-marginal. 10, alar.). 11. Capsules, operculate (wet), inoperculate (dry).

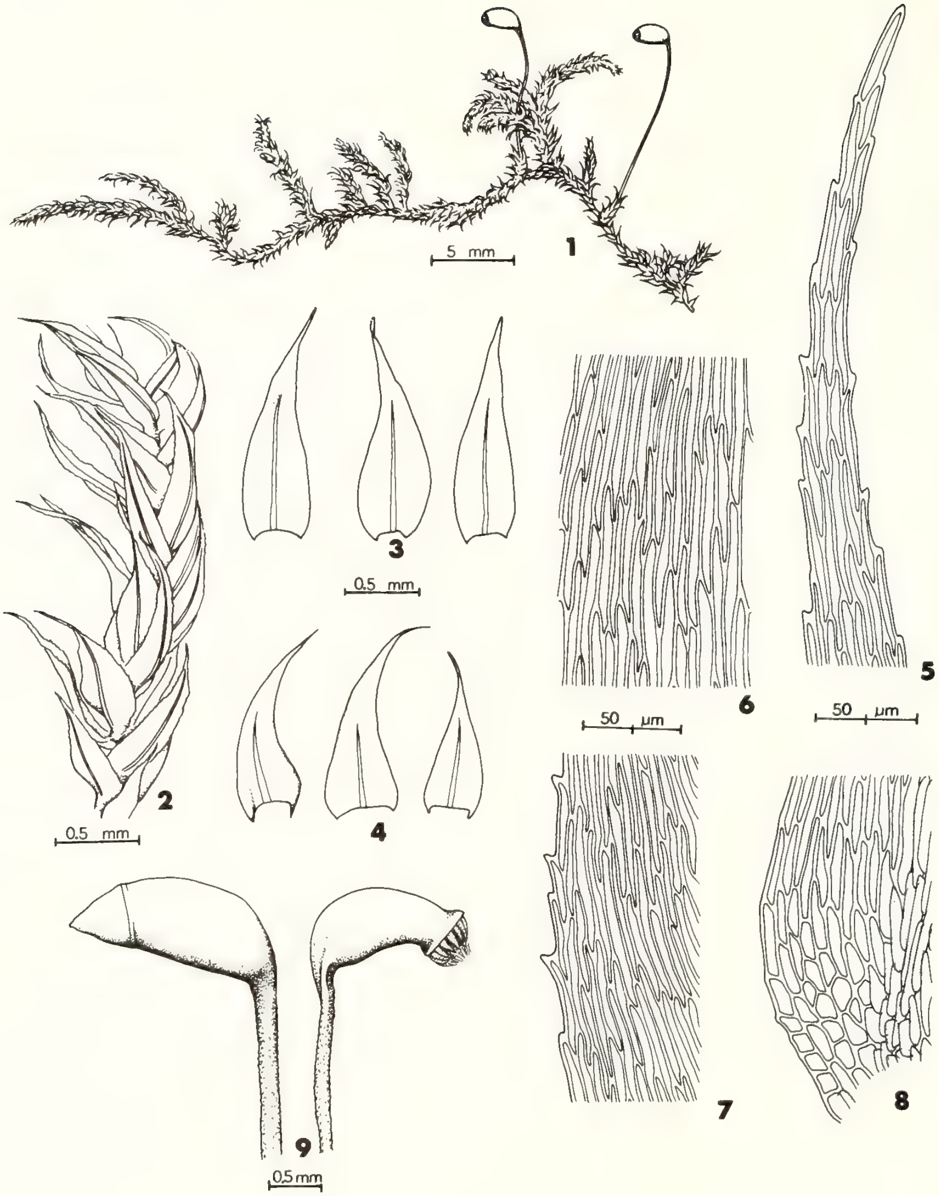
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Plate 309. *Brachythecium velutinum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

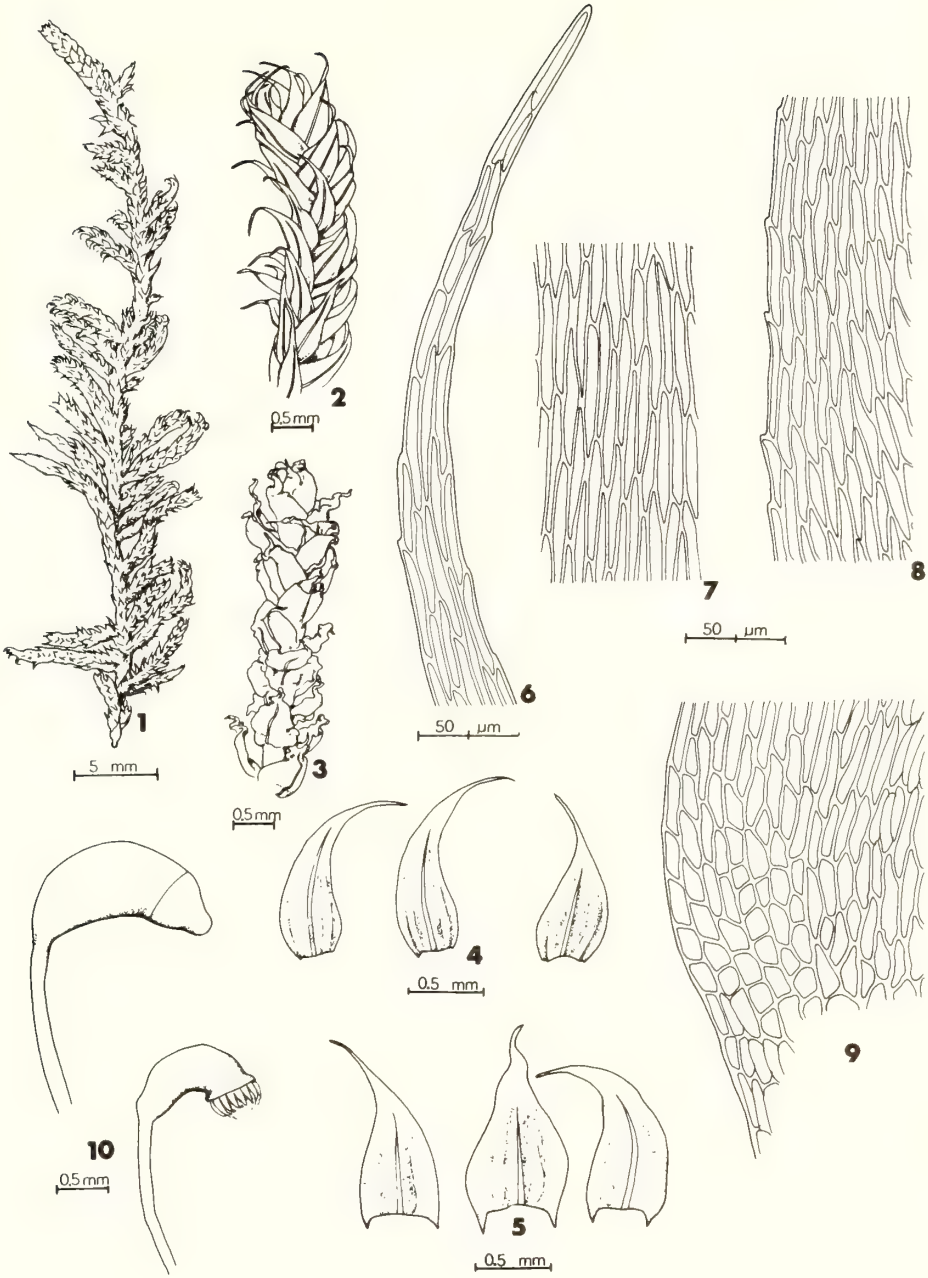
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Plate 310. *Brachythecium erythrorrhizon*. 1. Habit. 2. Portion of branch. 3. Apical portion of stem. 4. Branch leaves. 5. Stem leaves. 6–9. Cells of stem leaf (6, apical. 7, median. 8, median-marginal. 9. alar.). 10. Capsules, operculate (wet), inoperculate (dry).

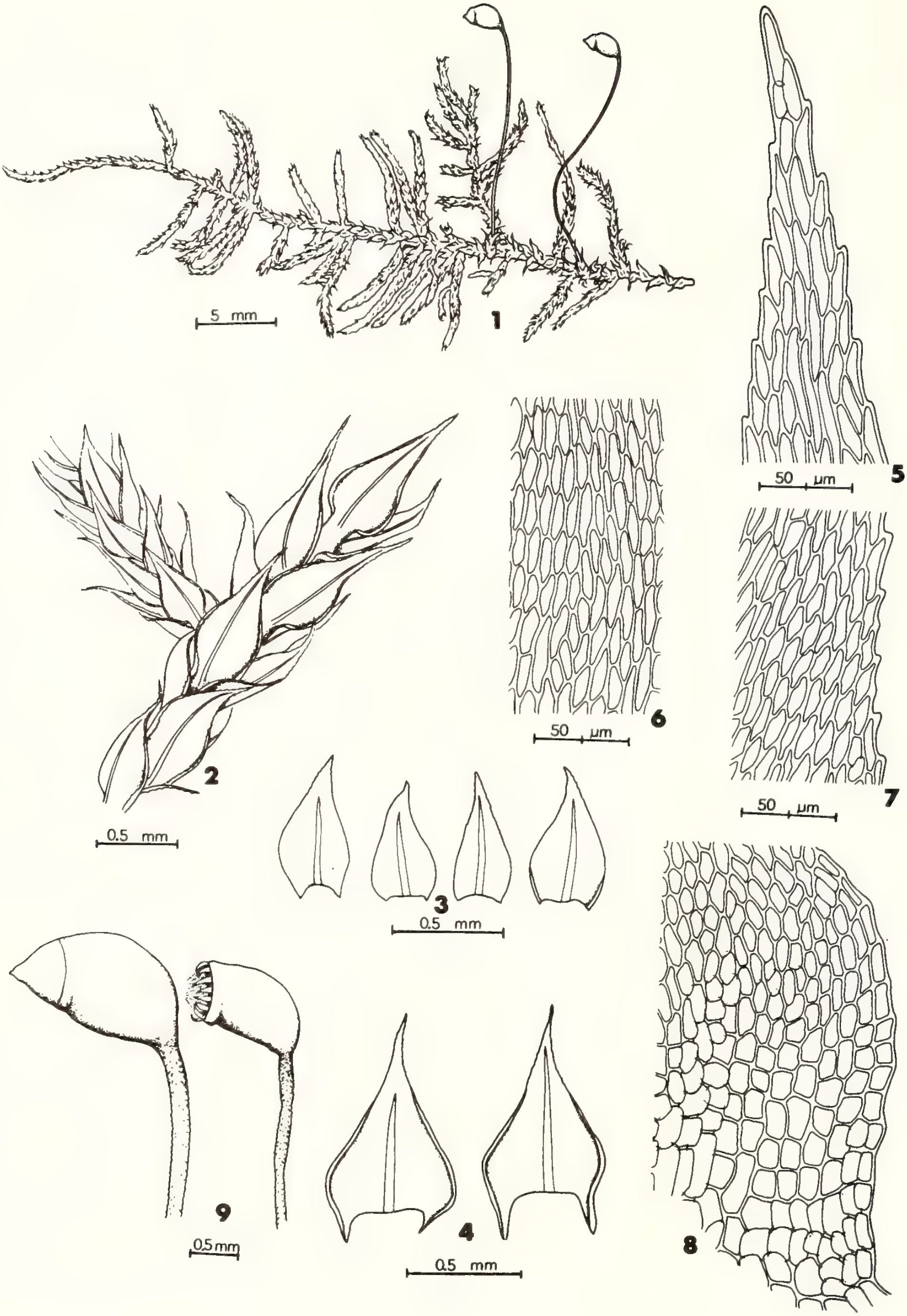
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Plate 311. *Brachythecium reflexum*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median- marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

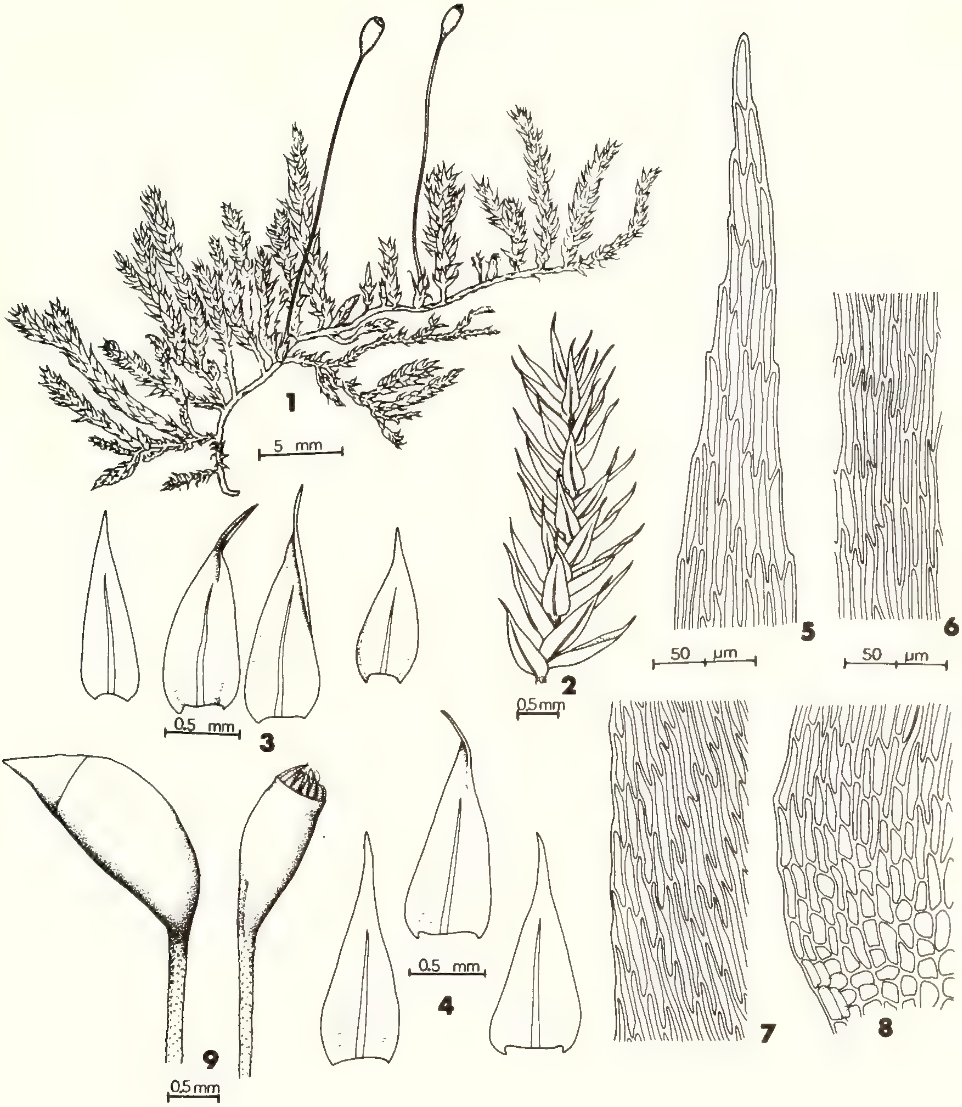
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Plate 312. *Brachythecium plumosum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

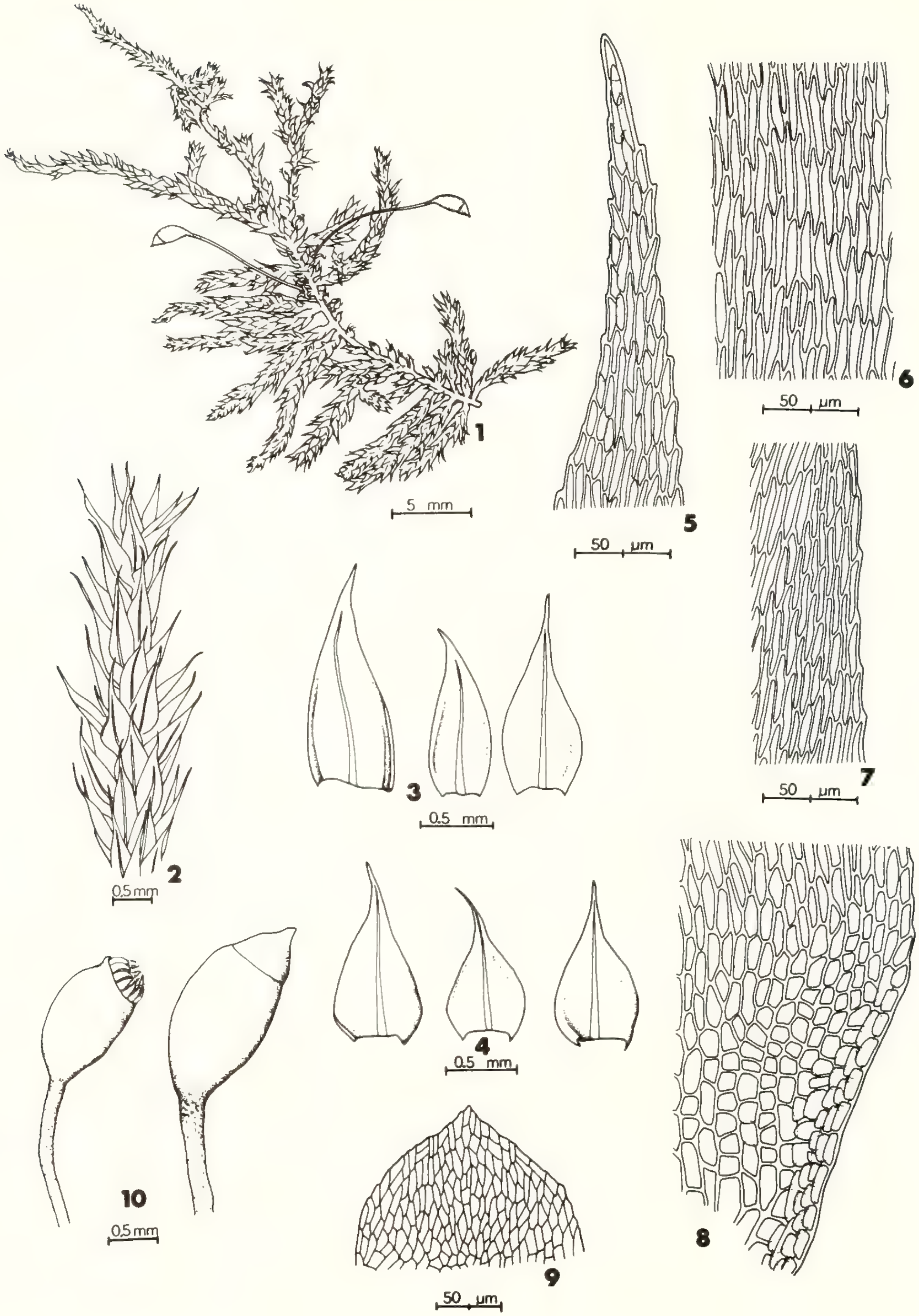
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Plate 313. *Brachythecium populeum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllium. 10. Capsules, operculate (wet), inoperculate (dry).

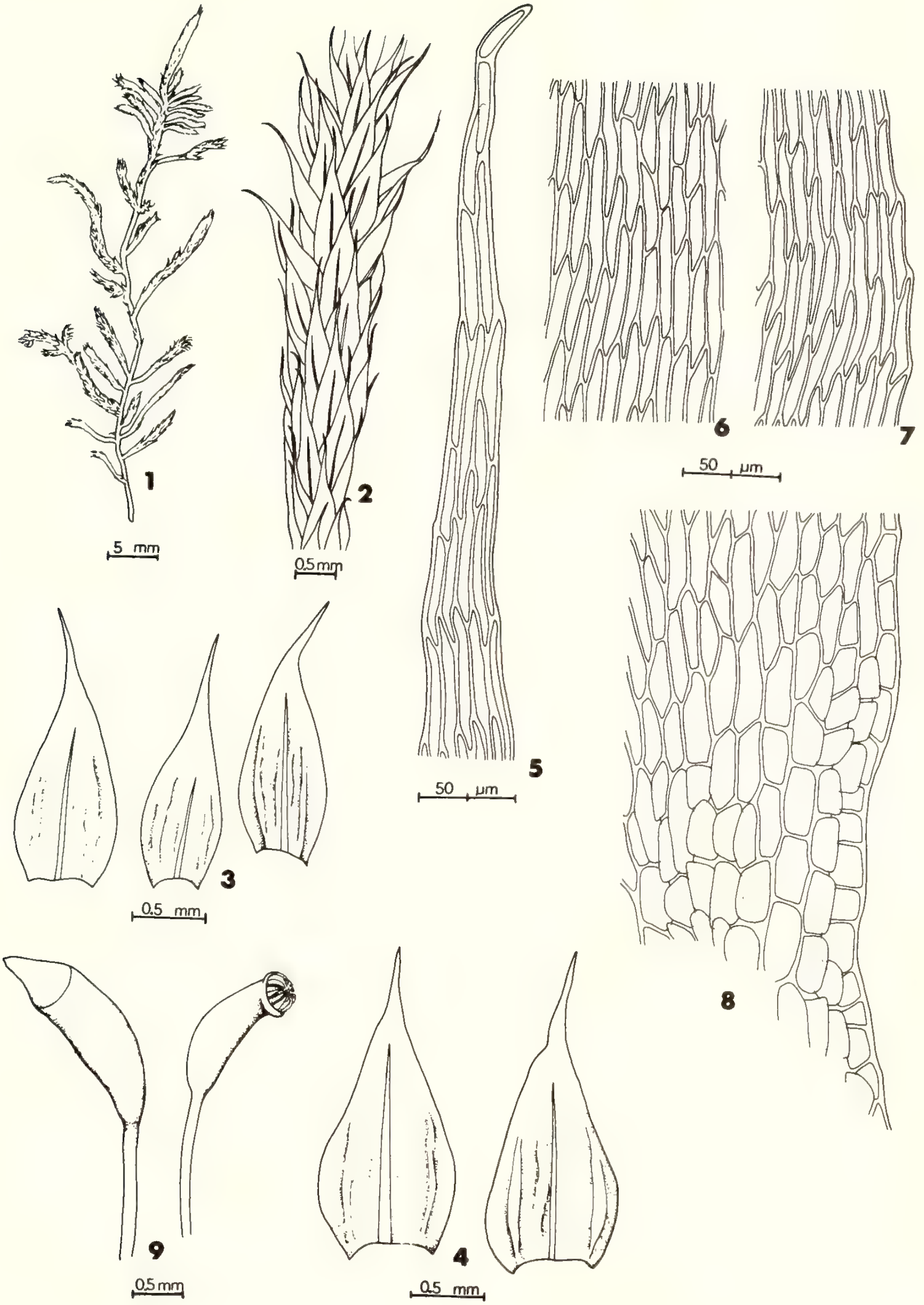
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Plate 314. *Brachythecium albicans*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

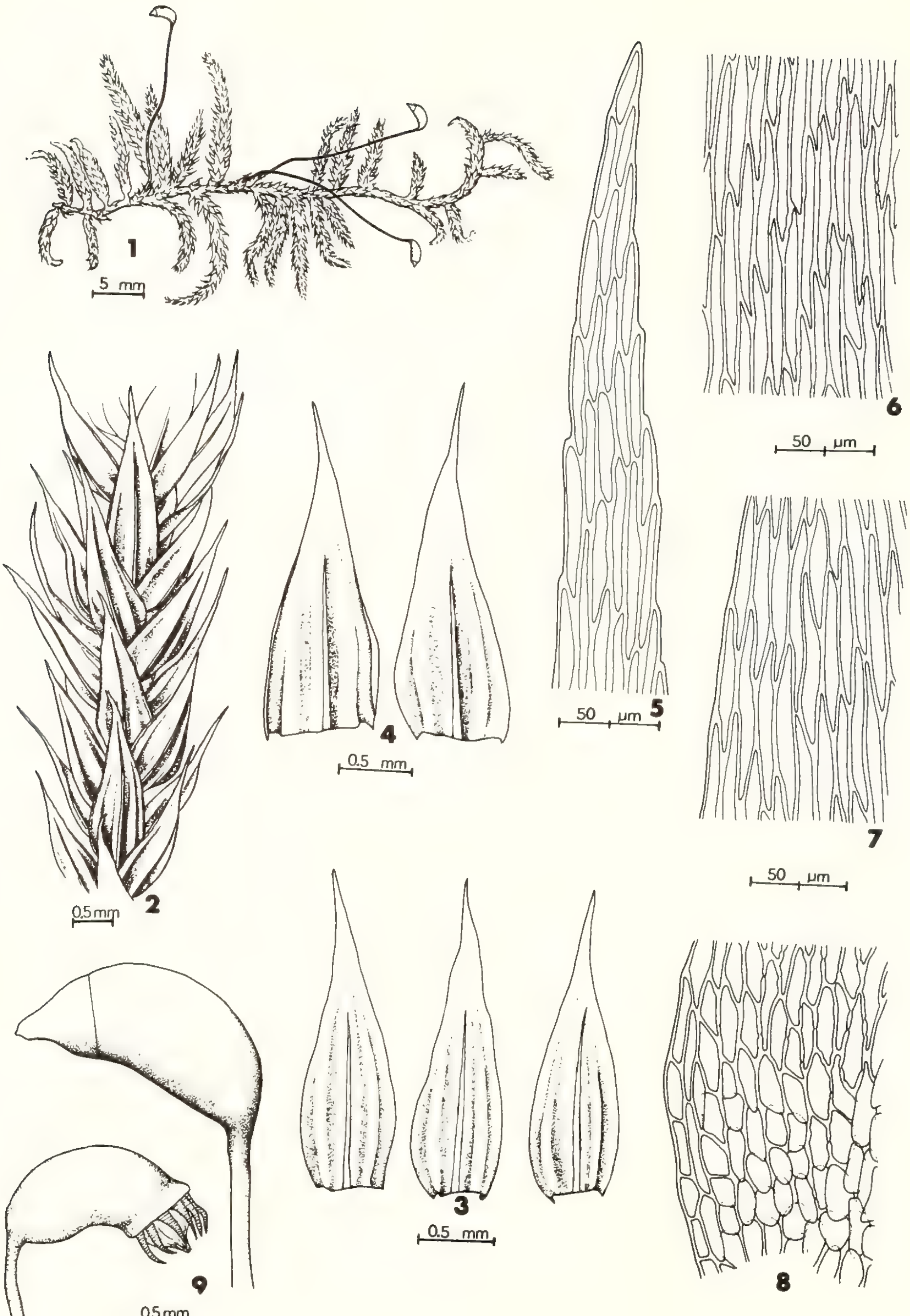
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Plate 315. *Brachythecium salebrosum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

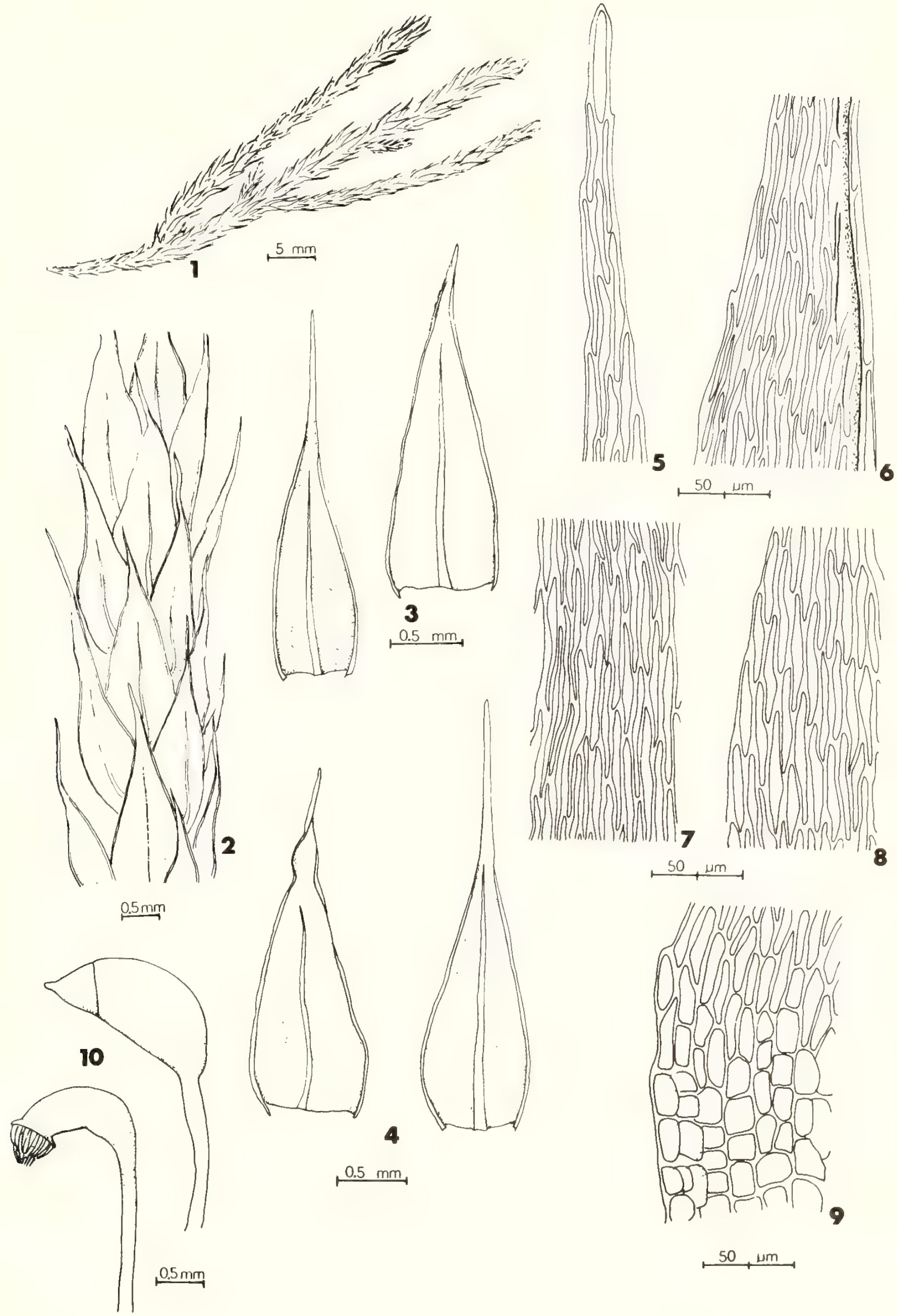
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Plate 316. *Brachythecium turgidum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–9. Cells of stem leaf (5, apical. 6, upper cells. 7, median. 8, median-marginal. 9, alar.). 10. Capsules, operculate (wet), inoperculate (dry).

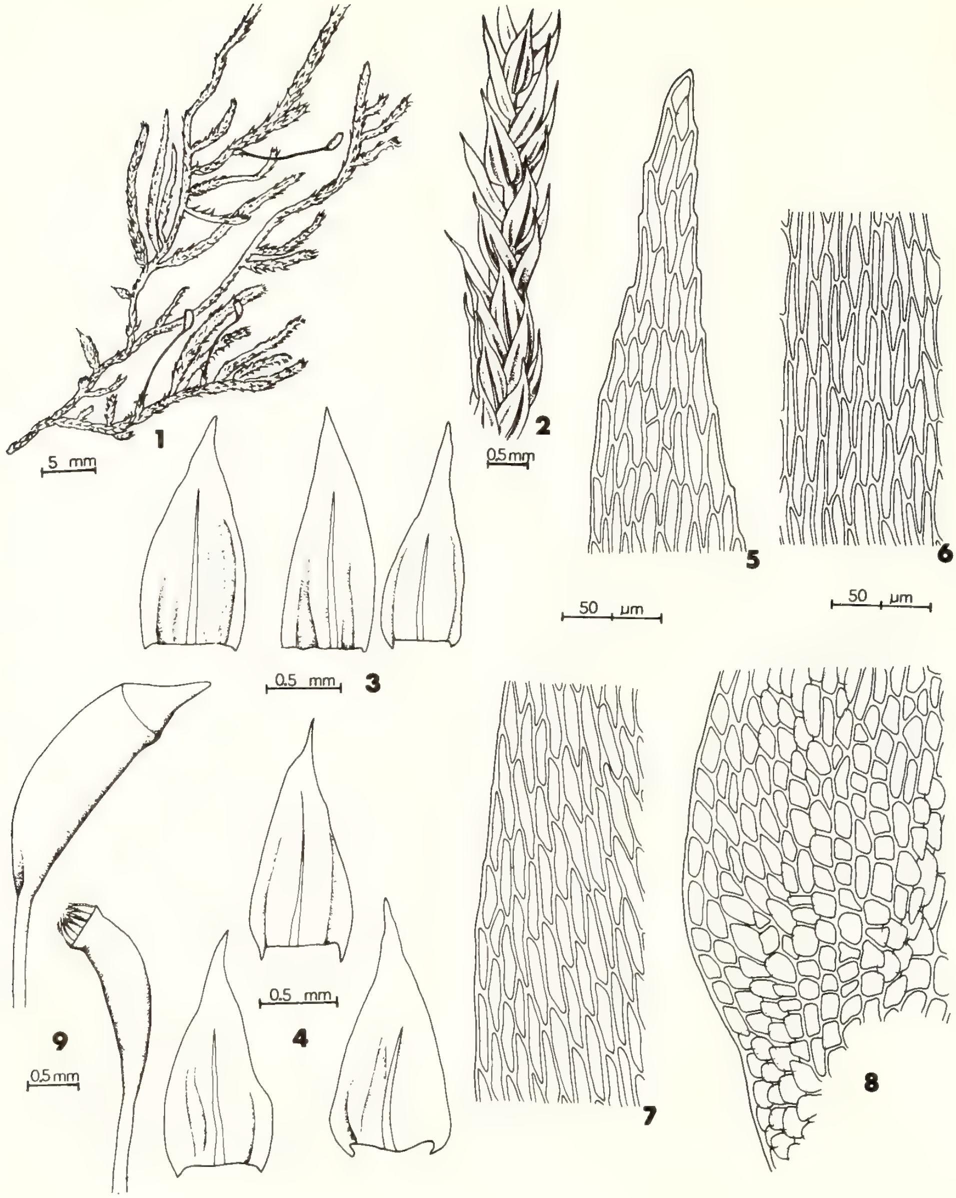
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Plate 317. *Brachythecium oxycladon*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

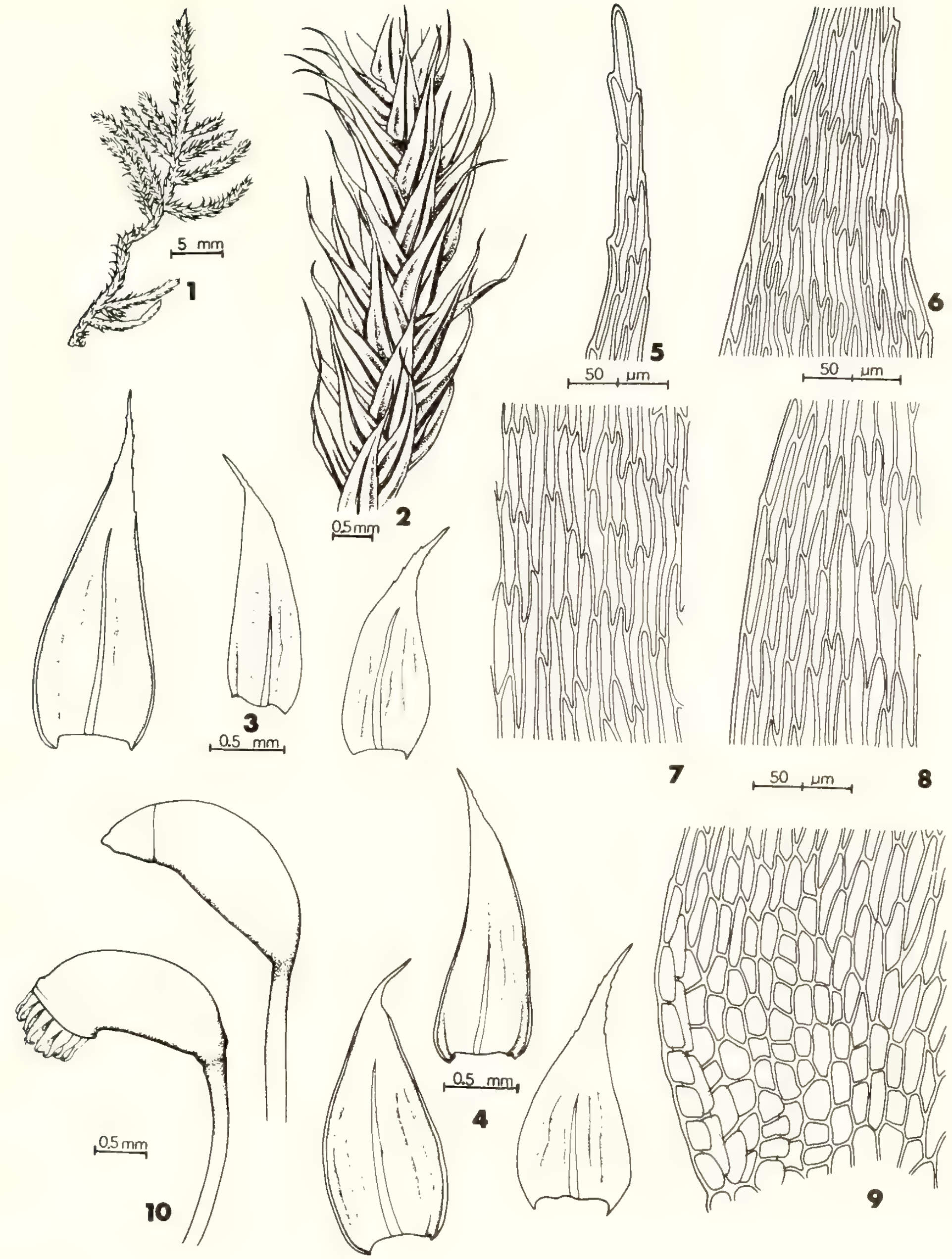
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Plate 318. *Brachythecium calcareum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–9. Cells of stem leaf (5, apical. 6, upper, just below apex. 7, median. 8, median-marginal. 9, alar.). 10. Capsules, operculate (wet), inoperculate (dry).

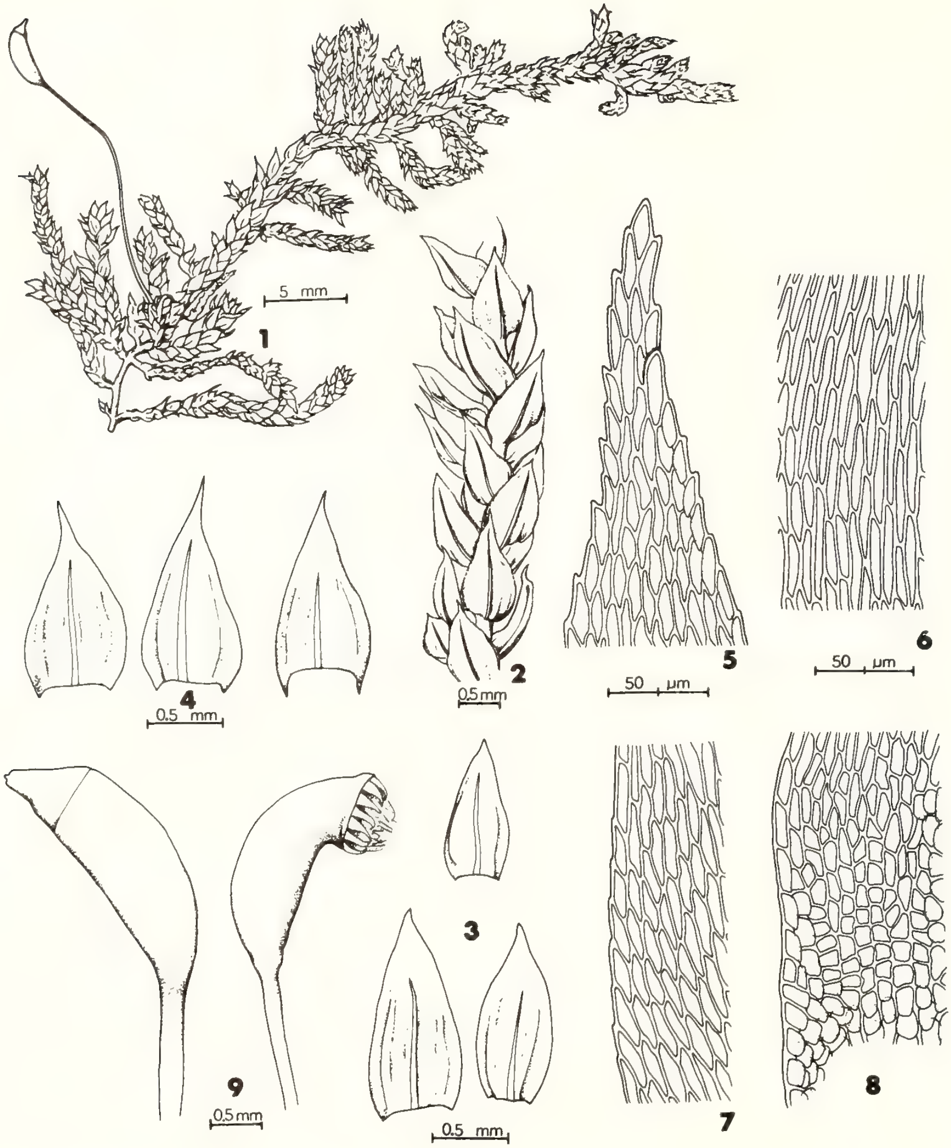
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Plate 319. *Brachythecium digastrum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

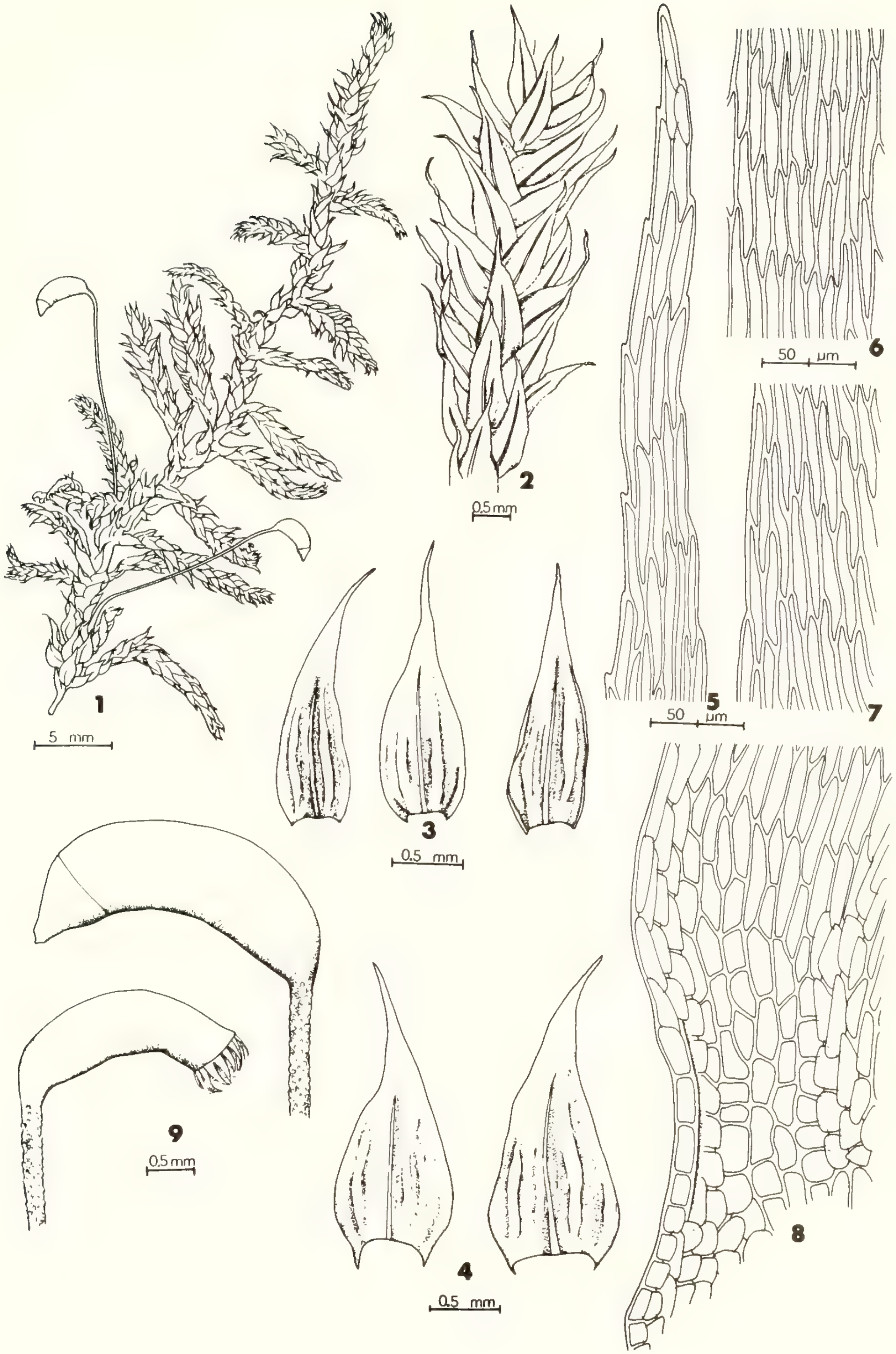
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Plate 320. *Brachythecium campestre*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

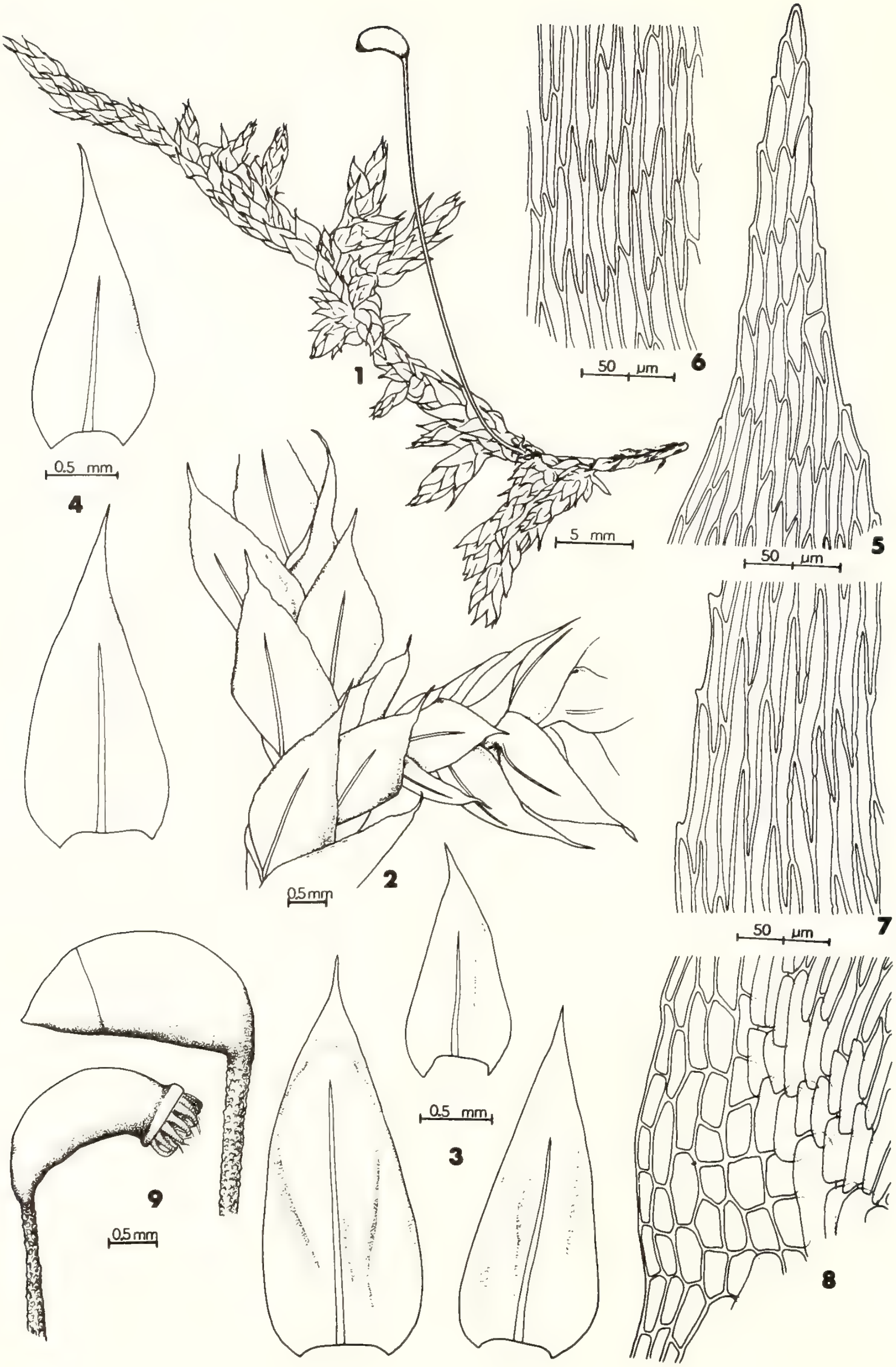

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Plate 321. *Brachythecium rutabulum*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

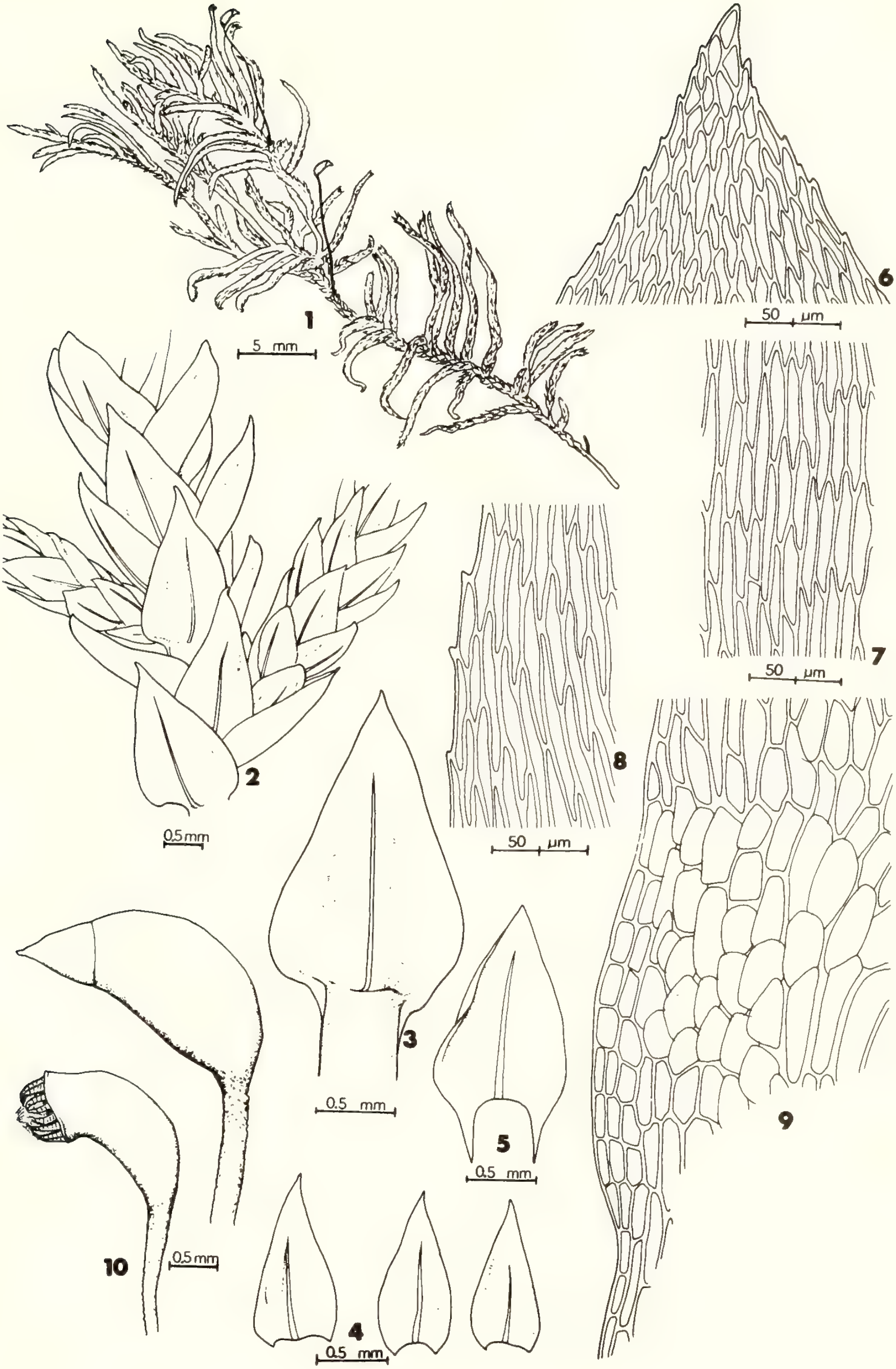
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Plate 322. *Brachythecium rivulare*. 1. Habit. 2. Portion of stem and branches. 3. Portion of stem showing long-decurrent leaf. 4. Branch leaves. 5. Stem leaf. 6–9. Cells of stem leaf (6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Capsules, operculate (wet), inoperculate (dry).

4. **Bryhnia** Kaur., Bot. Not. 1892: 61. 1892.

Habit: Prostrate, in loose to dense mats.

Colour: Green to yellowish green, brownish green with age, glossy.

Stems: 2–6 cm long, creeping to ascending, irregularly to subpinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, orbicular, sometimes lacking.

Leaves: Stem and branch leaves similar except in size, close to distant, concave, erect to erect-spreading, somewhat contorted when dry, smooth or weakly striate when dry, lanceolate, ovate or ovate-lanceolate, acute to acuminate, often twisted at apex, decurrent. Perichaetial leaves sheathing base of seta, lanceolate, long-acuminate, smooth.

Leaf Margins: Plane, serrulate to serrate throughout.

Costae: Single, extending 1/2–3/4 the leaf length, scarcely prominent on dorsal surface, sometimes with teeth on dorsal surface near apex.

Leaf Cells: Smooth or prorate on dorsal surface, the walls thick or of medium thickness, basal cells often with a few pits. Median cells fusiform, vermicular or oblong-rhomboidal, alar cells often enlarged, rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked or reported with a few scattered hairs (*B. graminicolor*), yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong-cylindric, arcuate, inclined to horizontal, smooth, contracted below mouth when dry.

Setae: Straight to somewhat flexuose, rough throughout, sometimes slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic to rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 1–3 cilia, nodose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 12–19 μm in longest dimension.

1. Branch leaves broad, 2–3:1, acute to broadly acuminate, twisted 1/2 turn at apex; upper leaf cells weakly prorate on dorsal surface .... 1. *B. novae-angliae*
1. Branch leaves narrow, 3–5:1, narrowly acuminate, not or only somewhat twisted at apex; upper leaf cells strongly prorate on dorsal surface .... 2. *B. graminicolor*

1. Bryhnia novae-angliae (Sull & Lesq. *ex* Sull.) Grout, Bull. Torrey Bot. Cl. 25: 229. 1898.
Hypnum novae-angliae Sull. & Lesq. *ex* Sull., Man. Bot. No. U.S. ed. 2: 676. 1856.
PLATE 323

Plants medium-sized, green to yellowish green, stems irregularly branched, up to 6 cm long, leaves 1.0–1.5 mm long, 0.5–1.0 mm wide, ovate to ovate-lanceolate, concave, acute to acuminate, usually twisted at apex, smooth or weakly striate when dry, serrulate on margins, decurrent, upper cells weakly prorate on dorsal surface, costae single, extending 1/2–3/4 the leaf length; dioicous, setae rough throughout, 1–2 cm long, capsules oblong-cylindric, arcuate, inclined to horizontal, 1.5–2.5 mm long.

Habitat: On rotten logs, humus in woods, rock and soil in wet shady places and along brooks.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Queen's, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Halifax, Hants, Inverness, Kings, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Labrador to Ontario, south to Georgia, Tennessee, and Arkansas; disjunct to *Alaska, *British Columbia (?), and California. Europe, Asia.

Chromosome Number: n = 11.

2. Bryhnia graminicolor (Brid.) Grout, Bull. Torrey Bot. Cl. 25: 231. 1898.

Hypnum graminicolor Brid., Spec. Musc. 2: 251. 1812.

PLATE 324

Plants similar to *B. novae-angliae* except smaller, stems up to 3 cm long, leaves shorter and narrower, 0.7–1.2 mm long, 0.3–0.6 mm wide, often lanceolate, acuminate, not twisted at apex, margins serrate, and upper cells strongly prorate on dorsal surface.

Habitat: On mainly calcareous soil and rock, often beside creeks, sometimes on bases of trees.

Maritime Distribution: Frequent. New Brunswick (Queen's); Nova Scotia (Cape Breton, Colchester, Inverness, Kings, Lunenburg); Prince Edward Island (Queens).

Range: Endemic to eastern North America, from *Labrador to Ontario, south to Virginia, Alabama, and Arkansas.

Chromosome Number: Unreported.

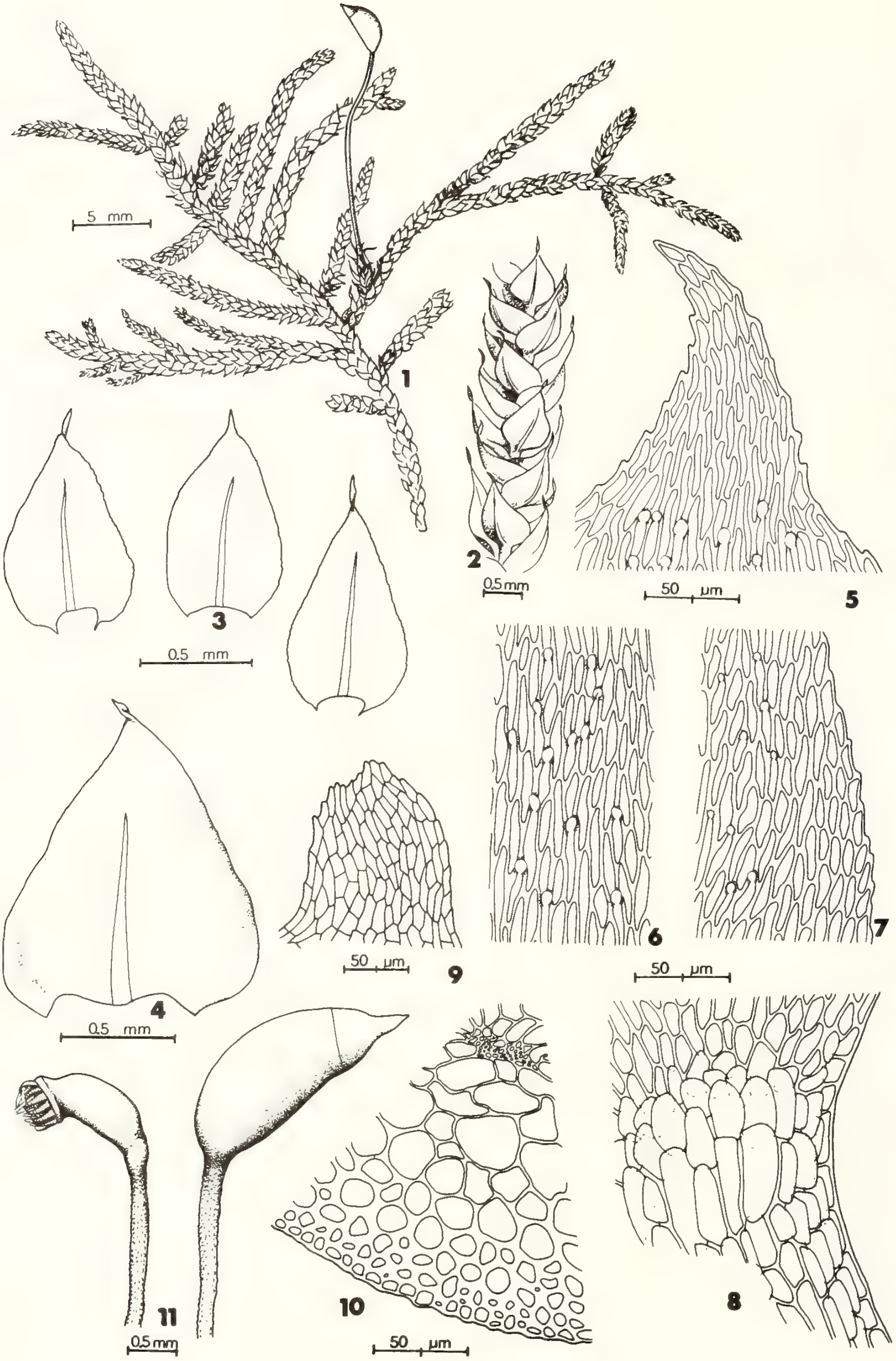
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Plate 323. *Bryhnia novae-angliae*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaf. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllium. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

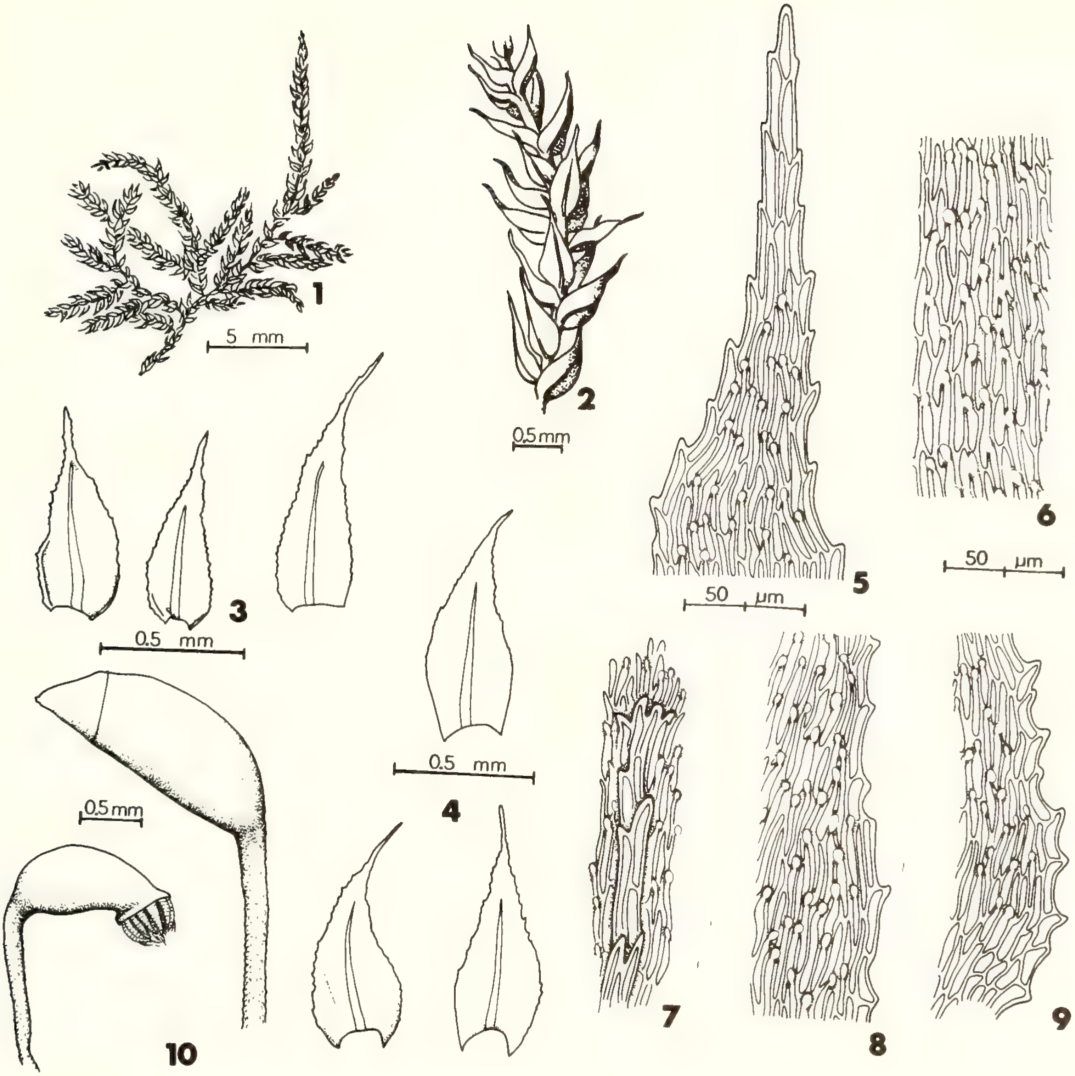
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Plate 324. *Bryhnia graminicolor*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5. Apical cells of stem leaf. 6. Median cells of stem leaf. 7. Apical portion of dorsal surface of costa. 8. Median-marginal cells of stem leaf. 9. Alar cells of stem leaf. 10. Capsules, operculate (wet), inoperculate (dry).

5. **Cirriphyllum** Grout, Bull. Torrey Bot. Cl. 25: 222. 1898.

Habit: Prostrate, in loose mats.

Colour: Light green to yellowish green, glossy.

Stems: 3–8 cm long, creeping, irregularly to subpinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth, in clusters just below juncture of leaves on stems and branches. Pseudoparaphyllia lacking.

Leaves: Stem and branch leaves similar except in size, close, somewhat imbricate, concave, erect to erect-spreading, scarcely changed when dry, weakly plicate, oblong-ovate, abruptly narrowed to a long acumen, shortly decurrent. Perichaetial leaves sheathing base of seta, lanceolate, long-acuminate, smooth.

Leaf Margins: Plane or incurved, serrulate to serrate nearly to base.

Costae: Single, extending $^1/_2$–$^2/_3$ the leaf length, scarcely prominent on dorsal surface.

Leaf Cells: Smooth, the walls thick or of medium thickness, often pitted. Median cells fusiform to vermicular, alar cells enlarged, quadrate to rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown, reddish brown or orange, sometimes nearly black, oblong-cylindric, arcuate, inclined to horizontal, smooth, contracted below mouth when dry.

Setae: Straight to somewhat flexuose, rough throughout, sometimes slightly twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic to long-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 2–3 cilia, nodose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 10–17 μm in longest dimension.

1. **Cirriphyllum piliferum** (Hedw.) Grout, Bull. Torrey Bot. Cl. 25: 225. 1898.
Hypnum piliferum Hedw., Spec. Musc. 275. 1801.
PLATE 325

Plants medium-sized, light green to yellowish green, stems irregularly to subpinnately branched, up to 8 cm long, leaves 1.5–2.0 mm long, oblong-ovate, concave, abruptly narrowed to a long acumen, weakly plicate, serrulate to serrate on margins, costae single, extending $^1/_2$–$^2/_3$ the leaf length; dioicous, setae rough throughout, 1–3 cm long, capsules oblong-cylindric, arcuate, inclined to horizontal, 2–3 mm long.

Habitat: On humus and rocks in wet, shady places.

Maritime Distribution: Rare. New Brunswick (Queen's, Victoria); Nova Scotia (Kings).

Range: Labrador to Ontario, south to South Carolina, Ohio, and Michigan; also in *Alaska and *Washington. Europe, Asia, *Africa.

Chromosome Number: n = 11.

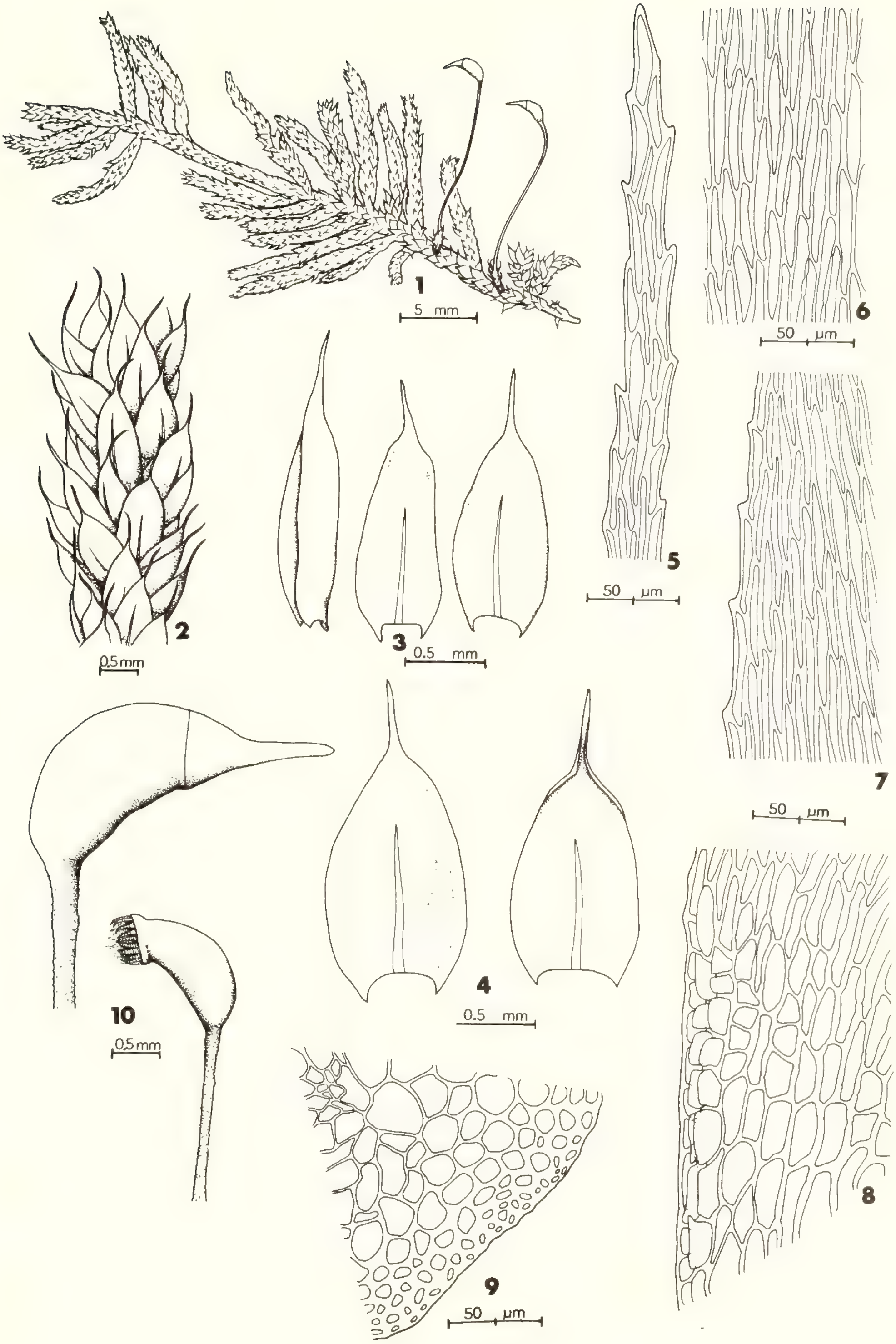
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Plate 325. *Cirriphyllum piliferum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

6. **Conardia** Robins., Phytologia 33: 294. 1976.

[Synonym: *Rhynchostegiella* (B.S.G.) Limpr.]

Habit: Stems prostrate, branches ascending, in dense mats.

Colour: Light green to yellowish green, glossy.

Stems: 1–2 cm long, creeping, irregularly branched, epidermal cells small and thick-walled in cross-section, rhizoids papillose, on stems just below juncture of leaves directly below costae. Pseudoparaphyllia foliose, lanceolate, some filamentous.

Leaves: Stem and branch leaves similar, close, weakly concave, erect to erect-spreading, sometimes falcate-secund on branches, scarcely changed when dry, smooth, lanceolate, acuminate, apices sometimes broadly acute, shortly decurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate, smooth.

Leaf Margins: Plane or somewhat incurved, serrulate to serrate throughout, adjacent cells at base of leaf often forming serrations.

Costae: Single, subpercurrent to percurrent, scarcely prominent on dorsal surface, rhizoids papillose, arising from dorsal surface usually near base.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits. Median cells fusiform to linear-rhomboidal, alar cells quadrate to rectangular.

Asexual Reproductive Bodies: Cylindrical, uniseriate, multicellular, papillose gemmae often present on dorsal surface of costae near apex.

Sex: Autoicous. Maritime plants unknown with sporophytes.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, yellowish brown, orange or reddish brown, oblong-cylindric, straight to slightly arcuate, suberect to inclined, smooth, contracted below mouth and contracted and wrinkled at neck when dry.

Setae: Straight to somewhat flexuose, smooth, sometimes slightly twisted when dry, yellow, orange or red.

Annuli: 1–2 rows of large cells, deciduous.

Opercula: Conic to rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 0–2 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–17 μm in longest dimension.

1. **Conardia compacta** (C. Müll.) Robins., Phytologia 33: 295. 1976.
Hypnum compactum C. Müll., Syn. 2: 408. 1851.
[Synonyms: *Amblystegium compactum* (C. Müll.) Aust.; *Rhynchostegiella compacta* (C. Müll.) Loeske]
PLATE 326

Plants small, in dense, light green to yellowish green mats, stems irregularly branched, up to 2 cm long, leaves 0.5–1.5 mm long, lanceolate, acuminate, smooth, serrulate to serrate on margins, costae single, subpercurrent to percurrent, gemmae often present on dorsal surface of costae near apex, cylindrical, uniseriate, multicellular bodies; sporophytes unknown on Maritime plants.

Habitat: On moist, calcareous bluffs.

Maritime Distribution: Rare. Nova Scotia (Halifax). Collected once by M.S. Brown, 19 September 1928, without specific locality data.

Range: Newfoundland to *Yukon Territory, south to *Pennsylvania, Indiana, Missouri, South Dakota, Colorado, Arizona, and California. Mexico, Europe, *Asia.

Chromosome Number: Unreported.

Remarks: Capsules drawn from Wyoming plants.

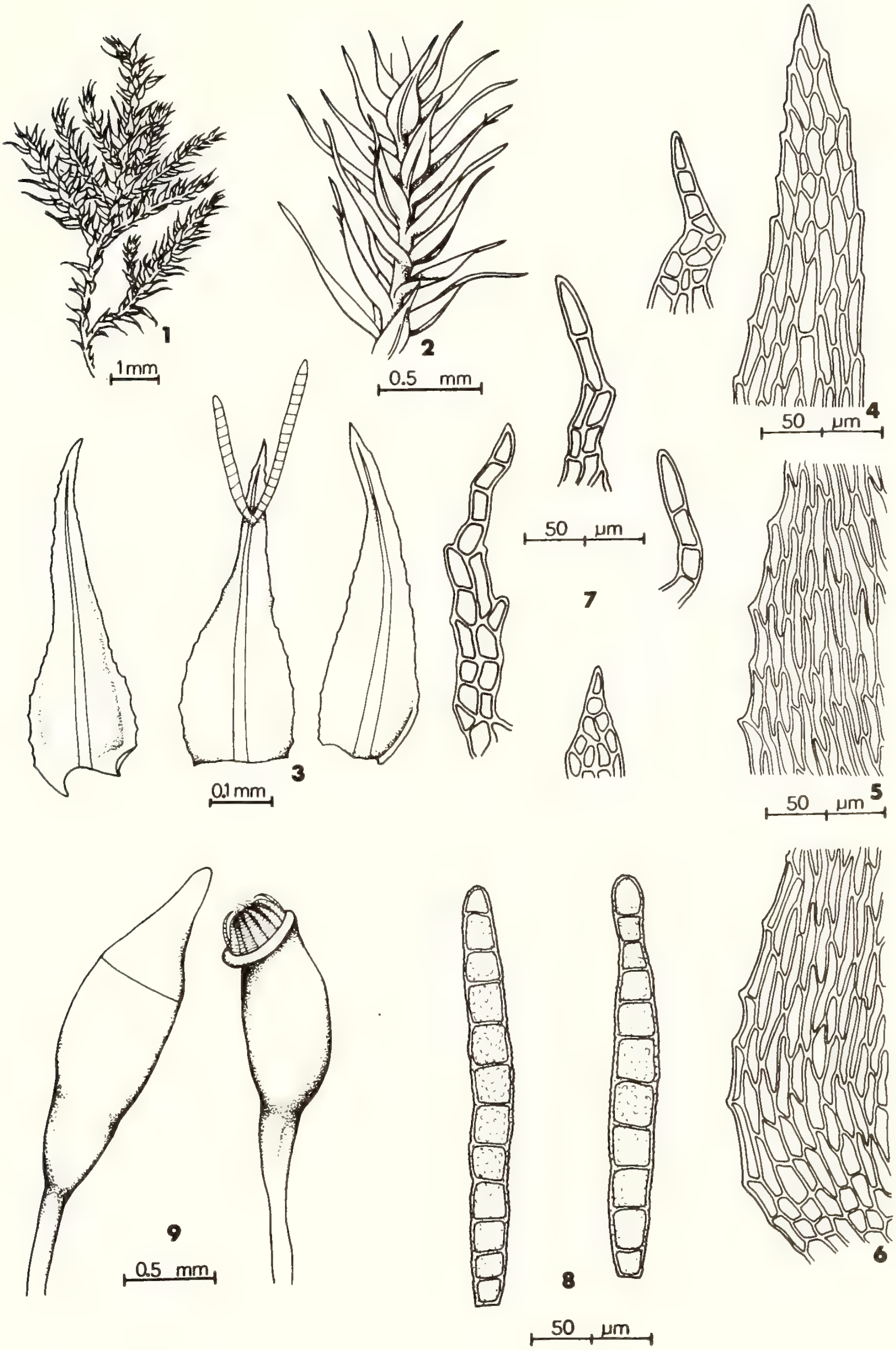
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Plate 326. *Conardia compacta*. 1. Habit. 2. Portion of branch. 3. Leaves (leaf in centre with gemmae). 4–6. Leaf cells (4, apical. 5, median-marginal. 6, alar.). 7. Pseudoparaphyllia. 8. Gemmae. 9. Capsules, operculate (wet), inoperculate (dry).

7. **Eurhynchium** B.S.G., Bryol. Eur. 5: 217. 1854 (fasc. 57–61 Mon. 1).

Habit: Prostrate, in loose to dense mats.

Colour: Green, yellowish green, or brownish green, often glossy.

Stems: 2–5 cm long, creeping to ascending, simple or irregularly to subpinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, orbicular, sometimes lacking.

Leaves: Stem and branch leaves differing somewhat in size and shape, close to distant, concave, smooth to plicate, erect or spreading to squarrose, straight, somewhat contorted when dry, ovate, ovate-lanceolate or oblong-ovate, obtuse to short-acuminate, sometimes twisted at apex, shortly decurrent. Perichaetial leaves sheathing base of seta, lanceolate, long-acuminate, smooth to plicate.

Leaf Margins: Plane to recurved, serrulate to serrate throughout, sometimes nearly entire below.

Costae: Single, extending $^3/_4$ or more the leaf length, ending in a spine on the dorsal surface.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits or the basal cells with a few pits. Median cells fusiform or vermicular, apical cells shorter, sometimes rhombic, alar cells often enlarged, quadrate or rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous, dioicous or pseudomonoicous (male plants dwarf on the leaves of the female plants).

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong-ovoid or oblong-cylindric, arcuate, inclined to horizontal, smooth, contracted below mouth when dry.

Setae: Straight to somewhat flexuose, smooth or rough, occasionally twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Long-rostrate, arcuate.

Peristomes: Double, hypnaceous, exostome brown to reddish brown, endostome hyaline, 1–3 cilia, nodose to nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 10–20 μm in longest dimension.

1. Plants with large leaves, 1.5 mm long or more; aquatic, occurring on rocks in or beside streams .... 3. *E. riparioides*
1. Plants with small leaves, seldom reaching 1.5 mm long; not aquatic but often growing in moist habitats 2
    2. Plants somewhat complanate; leaves acute to acuminate, often with twisted apices; setae rough .... 2. *E. hians*
    2. Plants often julaceous or nearly so; leaves acute to obtuse, apices not twisted; setae smooth .... 1. *E. pulchellum*

1. Eurhynchium pulchellum (Hedw.) Jenn., Man. Moss W. Pennsylv. 350. 1913.

Hypnum pulchellum Hedw., Spec. Musc. 265. 1801.

[Synonym: *E. strigosum* (Web. & Mohr) B.S.G.]

PLATE 327

Plants terrestrial, medium-sized, stems irregularly to subpinnately branched, leaves 0.7–1.5 mm long, 0.5–1.0 mm wide, ovate, ovate-lanceolate or oblong-ovate, acute to narrowly obtuse, margins serrulate to serrate nearly to base, plane or recurved nearly to apex, costae single, extending $^3/_4$ or more the leaf length, ending in a spine on the dorsal surface; pseudomonoicous, setae smooth, 1–2 cm long, capsules oblong-cylindric, arcuate, inclined to horizontal, 1.5–2.5 mm long.

Habitat: On soil, rotten logs, bases of trees, rock outcrops and on humus over rock.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Queen's, Restigouche, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Digby, Hants, Kings, Pictou, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to *Georgia, Louisiana, Texas, Arizona, and California. Mexico, *South America, Europe, Asia, *Africa.

Chromosome Number: n = 7, 9, 10, 20.

2. Eurhynchium hians (Hedw.) Sande Lac., Ann. Mus. Bot. Lugd. Bat. 2: 299. 1866.
Hypnum hians Hedw., Spec. Musc. 272. 1801.
PLATE 328

Plants terrestrial, medium-sized, stems irregularly branched, leaves 0.8–1.5 mm long, 0.5–1.0 mm wide, ovate-lanceolate to ovate, acute to short-acuminate, often twisted at apex, margins serrulate to serrate throughout, plane, sometimes recurved at base, costae single, extending 3/4 or more the leaf length, ending in a spine on the dorsal surface; dioicous, Maritime plants sterile, reported to have setae rough, 1–2 cm long, capsules oblong-cylindric, arcuate, inclined, 2.0–3.5 mm long.

Habitat: Unknown for Maritime Provinces, but reported on soil and occasionally on other substrata in wet, shady places.

Maritime Distribution: Rare. Nova Scotia (Hants). Only one specimen of a few plants collected by J.S. Erskine *334* (ACAD 101, 141) is known. No other information was on the label.

Range: Nova Scotia to Ontario, south to Florida, Louisiana, Texas, *New Mexico, and Arizona. Mexico, Europe, Asia.

Chromosome Number: n = 7, 10.

Remarks: Capsules drawn from Ontario plants.

3. Eurhynchium riparioides (Hedw.) Rich., Ann. Bryol. 9: 135. 1937.
Hypnum riparioides Hedw., Spec. Musc. 242. 1801.
[Synonym: *E. rusciforme* Milde]
PLATE 329

Plants aquatic, large, stems simple or irregularly and sparingly branched, leaves 1.5–2.5 mm long, 1–2 mm wide, ovate to oblong-ovate, acute to narrowly obtuse, margins serrulate to serrate nearly to base, plane, costae single, extending 3/4 or more the leaf length, ending in a spine on the dorsal surface; autoicous, setae smooth, 1.0–2.5 cm long, capsules oblong-ovoid, arcuate, inclined to horizontal, 1.5–3.0 mm long.

Habitat: On wet rocks near streams and creeks, often submerged in water.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Queen's, Saint John, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Hants, Kings, Victoria).

Range: Labrador to Manitoba, south to North Carolina, Alabama, Arkansas, and *Oklahoma; disjunct to British Columbia, south to California, Arizona, Idaho, and Montana. *Central and South America, Europe, Asia, *Africa.

Chromosome Number: n = 8, 10, 11, 12, 20.

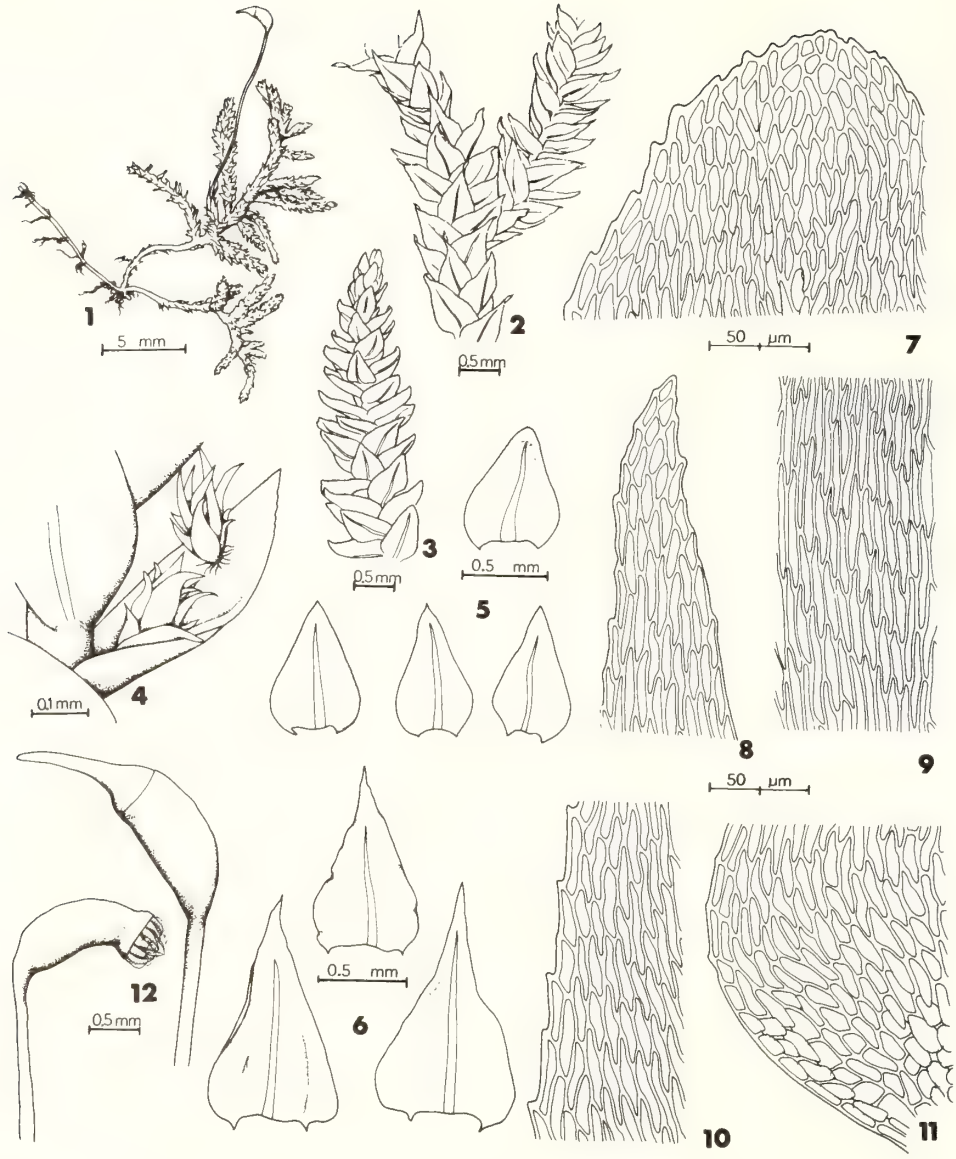
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Plate 327. *Eurhynchium pulchellum*. 1. Habit. 2. Portion of stem and branch. 3. Portion of branch. 4. Dwarf male plants on leaf of female plant. 5. Branch leaves. 6. Stem leaves. 7–11. Leaf cells (7, apical of branch leaf. 8, apical of stem leaf. 9, median of stem leaf. 10, median-marginal of stem leaf. 11, alar of stem leaf.). 12. Capsules, operculate (wet), inoperculate (dry).

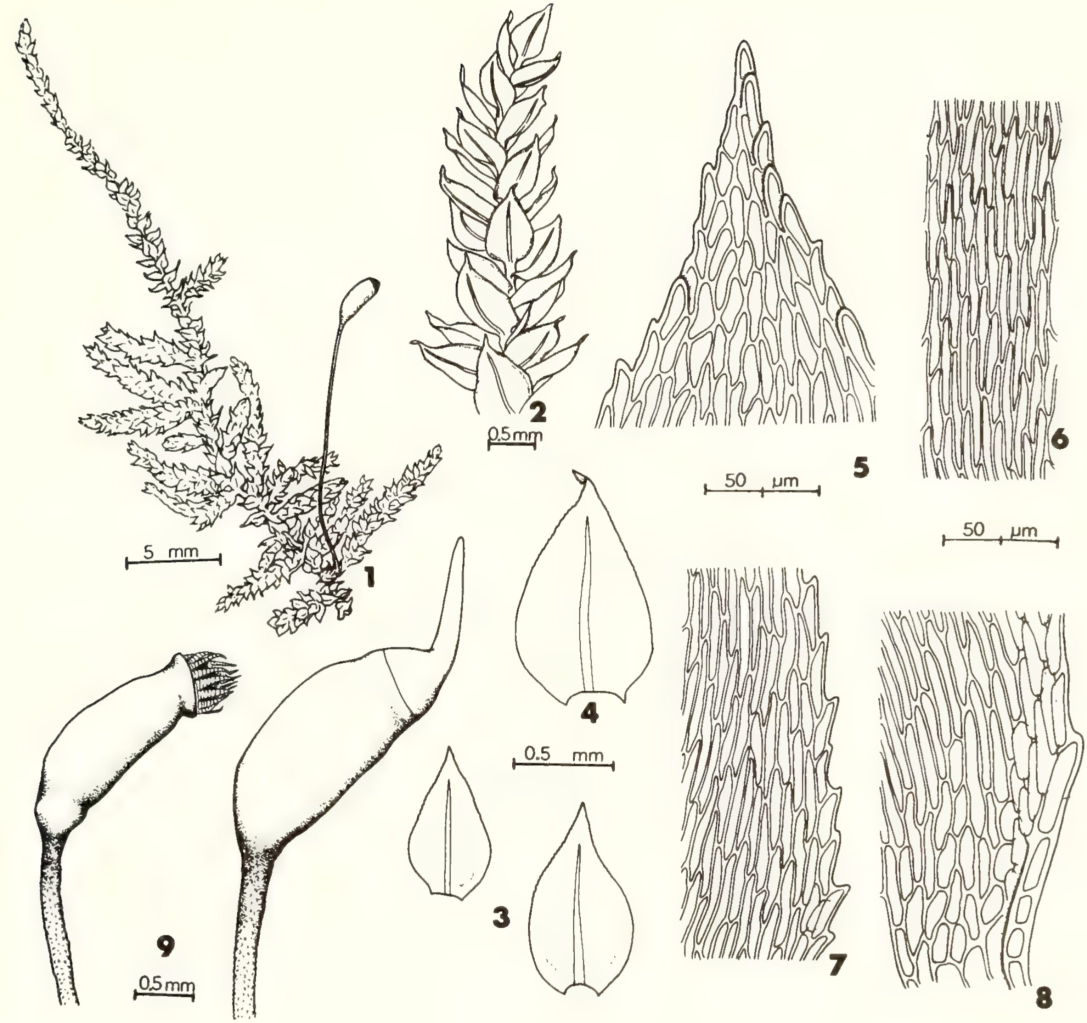
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Plate 328. *Eurhynchium hians*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaf. 5–8. Cells of stem leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

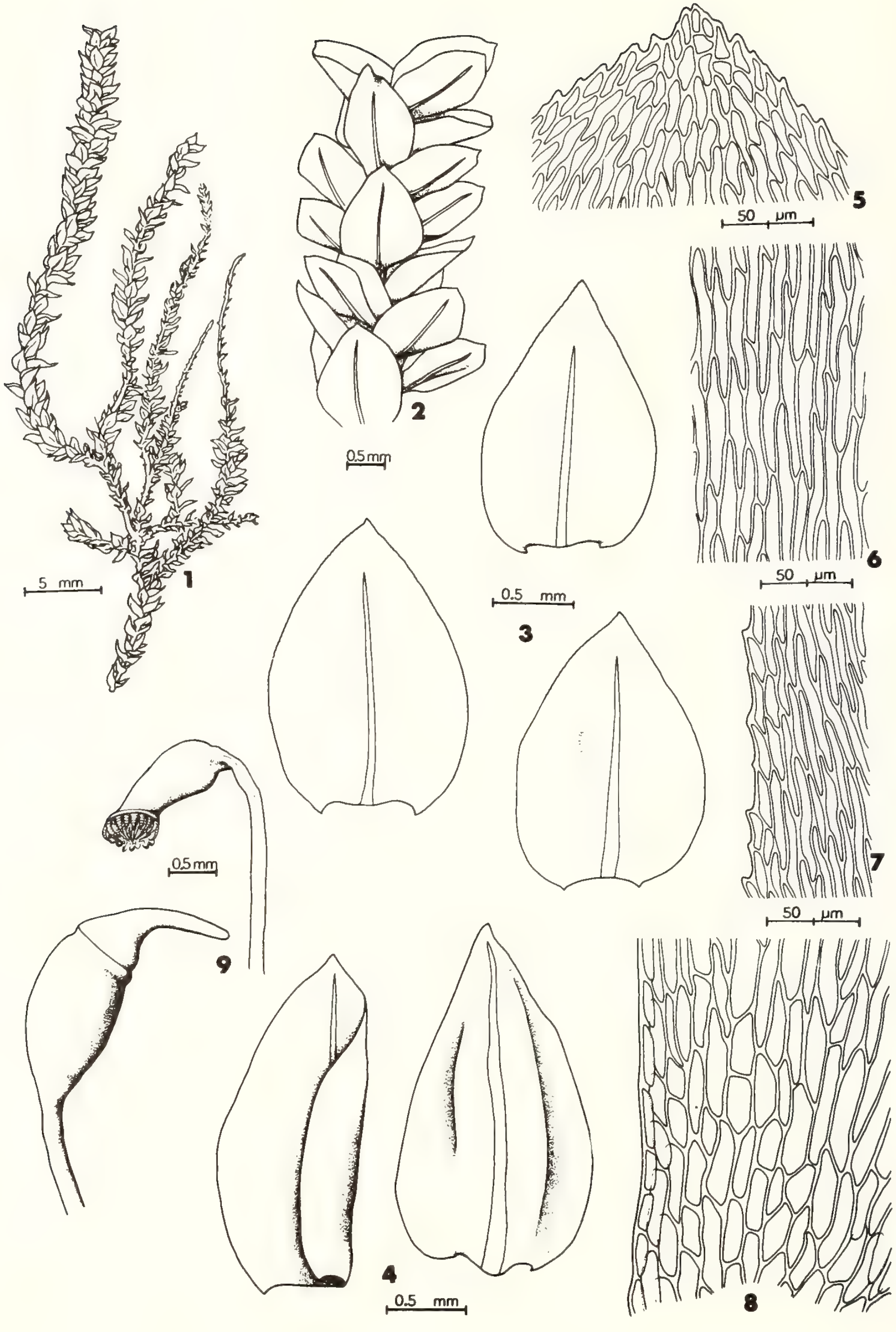
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Plate 329. *Eurhynchium riparioides*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical of branch leaf. 6, median of stem leaf. 7, median-marginal of branch leaf. 8, alar of stem leaf.). 9. Capsules, operculate (wet), inoperculate (dry).

8. **Stokesiella** (Kindb.) Robins., Bryologist 70(1): 39. 1967.
Eurhynchium subg. *Stokesiella* Kindb., Eur. N. Amer. Bryin. 1: 93. 1897.

Habit: Prostrate, in loose to dense mats.

Colour: Green, yellowish green or brownish green, often glossy.

Stems: 2–5 cm long, creeping to ascending, pinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth or papillose, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, orbicular, sometimes lacking.

Leaves: Stem and branch leaves differing in size and shape, close to distant, concave, smooth to plicate, erect or spreading to squarrose, straight, somewhat contorted when dry, ovate-lanceolate or ovate-cordate, acuminate, stem leaves abruptly acuminate and long-decurrent.

Leaf Margins: Plane or recurved at base, serrate throughout.

Costae: Single, extending $^3/_4$ or more the leaf length, ending in a spine on the dorsal surface.

Leaf Cells: Smooth, the walls thin or of medium thickness, lacking pits or the basal cells with a few pits. Median cells fusiform or vermicular, alar cells somewhat enlarged, quadrate or rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Maritime plants unknown with sporophytes.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, reddish brown, oblong-cylindric to oblong-ovoid, straight to slightly arcuate, inclined to horizontal, smooth, contracted below mouth when dry.

Setae: Straight to slightly flexuose, rough, twisted when dry, reddish brown.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Long-rostrate, arcuate.

Peristomes: Double, hypnaceous, exostome brown to reddish brown, endostome hyaline, 2–3 cilia, nodose.

Spores: Yellow to yellowish brown, globose to ovoid, smooth to minutely papillose, 10–15 μm in longest dimension.

1. **Stokesiella praelonga** (Hedw.) Robins. var. **stokesii** (Turn.) Crum, Bryologist 72(2): 245. 1969.

Hypnum stokesii Turn., Musc. Hib. 159. 1804. [Synonym: *Eurhynchium praelongum* var. *stokesii* (Turn.) Dix.]

PLATE 330

Plants medium-sized, stems pinnately branched, leaves 0.7–1.5 mm long, 0.3–1.0 mm wide, ovate-lanceolate or ovate-cordate, acuminate, stem leaves abruptly so, margins serrate to base, plane or recurved at base, costae single, extending $^3/_4$ or more the leaf length, ending in a spine on the dorsal surface; dioicous, Maritime plants sterile, reported to have setae rough, 2–3 cm long, capsules oblong-cylindric to oblong-ovoid, straight to somewhat arcuate, inclined to horizontal, 2.0–2.5 mm long.

Habitat: In bog and on sandy bank by pond.

Maritime Distribution: Rare. Nova Scotia (Shelburne, Sable Island).

Range: *Newfoundland to Ontario; disjunct to Alaska and British Columbia, south to California, Nevada, Idaho, and Montana. *Central America, Europe, *Asia, *Africa, *Australia, *New Zealand.

Chromosome Number: n = 7, 8, 10, 11, 12.

Remarks: *Stokesiella* is a segregate of *Eurhynchium*, differing mainly in the pinnately branched stems and the long-decurrent stem leaves.

Capsules drawn from Washington plants.

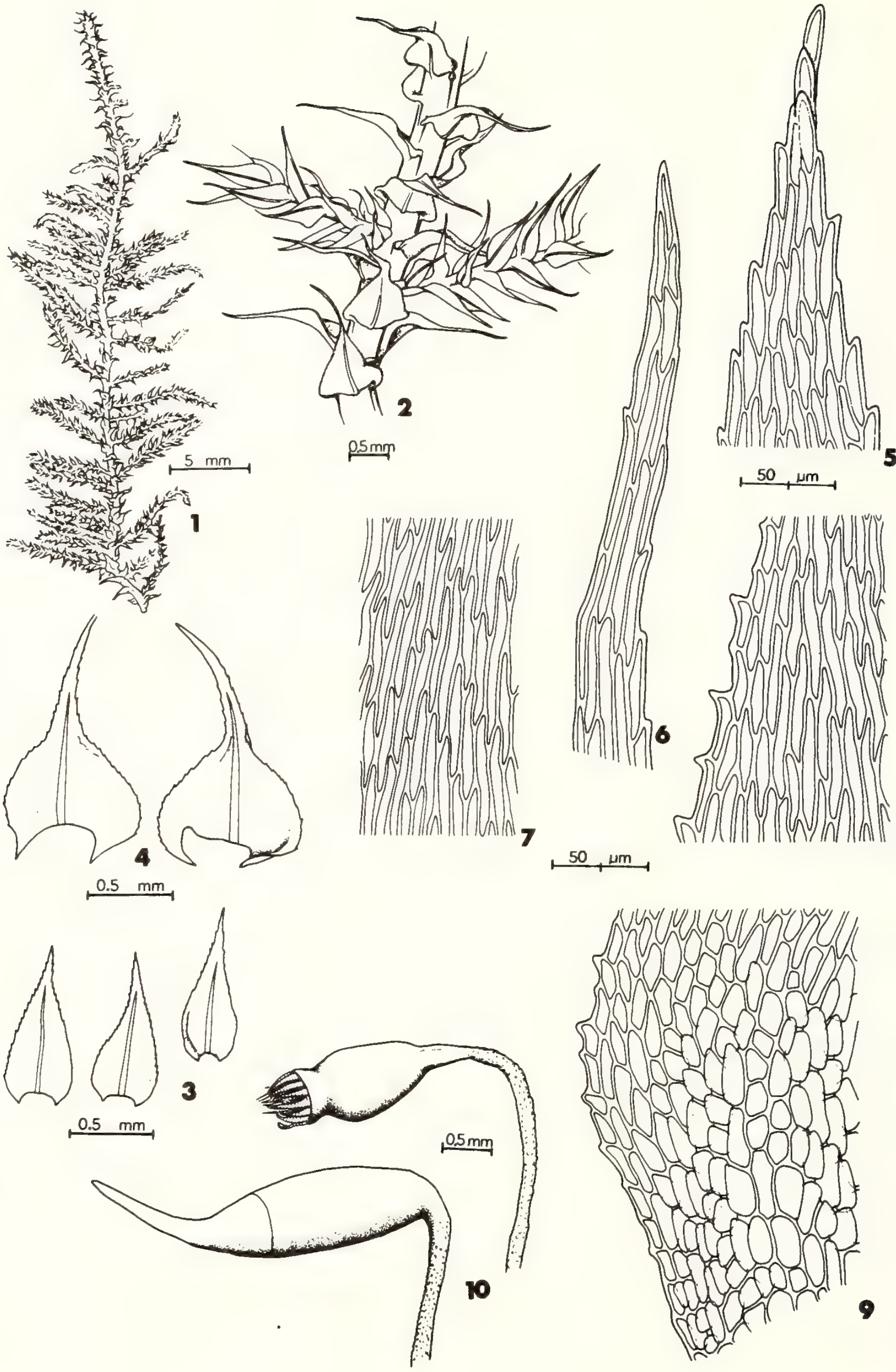
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Plate 330. *Stokesiella praelonga* var. *stokesii*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–9. Leaf cells (5, apical of branch leaf. 6, apical of stem leaf. 7, median of stem leaf. 8, median-marginal of stem leaf. 9, alar of stem leaf.). 10. Capsules, operculate (wet), inoperculate (dry).

Family ENTODONTACEAE

1. Plants large, stems red, over 5 cm long; leaves obtuse; capsules inclined to horizontal, arcuate .... 2. *Pleurozium* (p. 579)
1. Plants smaller, stems not red, less than 5 cm long; leaves acuminate; capsules erect, straight .... 1. *Entodon* (p. 577)

Buck (1980) has published a generic revision of the Entodontaceae in which he excludes *Pleurozium* and places it in the Hylocomiaceae because of similarities of its peristome with members of that family.

1. Entodon C. Müll., Linnaea 18: 704. 1845.

Habit: In prostrate, loose mats.
Colour: Light green to yellowish green or yellowish brown, glossy.
Stems: 2–4 cm long, prostrate, terete, irregularly branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth or minutely papillose, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, lanceolate, sometimes lacking.
Leaves: Stem and branch leaves similar, erect, imbricate, smooth, concave, lanceolate to ovate-lanceolate, acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.
Leaf Margins: Plane above, recurved at base, serrulate to serrate at apex and sometimes to middle of leaf.
Costae: Double, extending ca. 1/4 length of leaf.
Leaf Cells: Smooth, the walls thick, pitted or lacking pits. Median cells fusiform or vermicular, alar cells quadrate to rectangular, numerous, often extending nearly to costa.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous. Maritime plants seen only with setae.
Calyptrae: Cucullate, naked, yellowish with a reddish tip.
Capsules: Solitary, on setae scattered along stems, brown, cylindric to ovoid-cylindric, straight, erect, smooth, sometimes weakly striate when dry.
Setae: Straight to somewhat flexuose, smooth, often twisted when dry, reddish brown.
Annuli: 2–3 rows of large cells, persistent.
Opercula: High-conic, straight.
Peristomes: Double, inserted below mouth of capsule, 16 exostome teeth, lanceolate, brown or reddish brown, endostome segments fused to exostome, cilia lacking.
Spores: Yellow to yellowish brown, globose to ovoid, papillose, 14–24 μm in longest dimension.

1. Entodon brevisetus (Hook. & Wils. *ex* Wils.) Lindb., Act. Soc. Sci. Fenn. 10: 253. 1872.
Neckera breviseta Hook. & Wils. *ex* Wils., Hooker's J. Bot. 4: 419. 1842.
PLATE 331

Plants prostrate, light green to yellowish green or yellowish brown, medium-sized, stems 2–4 cm long, terete, irregularly branched, leaves imbricate, concave, lanceolate to ovate-lanceolate, long-acuminate, serrulate to serrate at apices, costae double, extending ca. 1/4 length of leaf, median cells fusiform or vermicular, alar cells quadrate to rectangular, numerous, often extending nearly to costa, autoicous, setae reddish brown, capsules cylindric to ovoid-cylindric, straight, erect, smooth, sometimes weakly striate when dry.

Habitat: On old logs.
Maritime Distribution: Rare. New Brunswick (Queen's). Collected in Canaan Forks by J. Moser in 1889 (CANM 183827).
Range: Known from *Newfoundland, New Brunswick, *Alberta, Maine, New Jersey, Virginia, North Carolina, *Pennsylvania, *Ohio, *Missouri, and Minnesota. *Asia.
Chromosome Number: n = 11.
Remarks: The capsules were drawn and described from New Jersey plants since only setae were present in the Maritime collection.

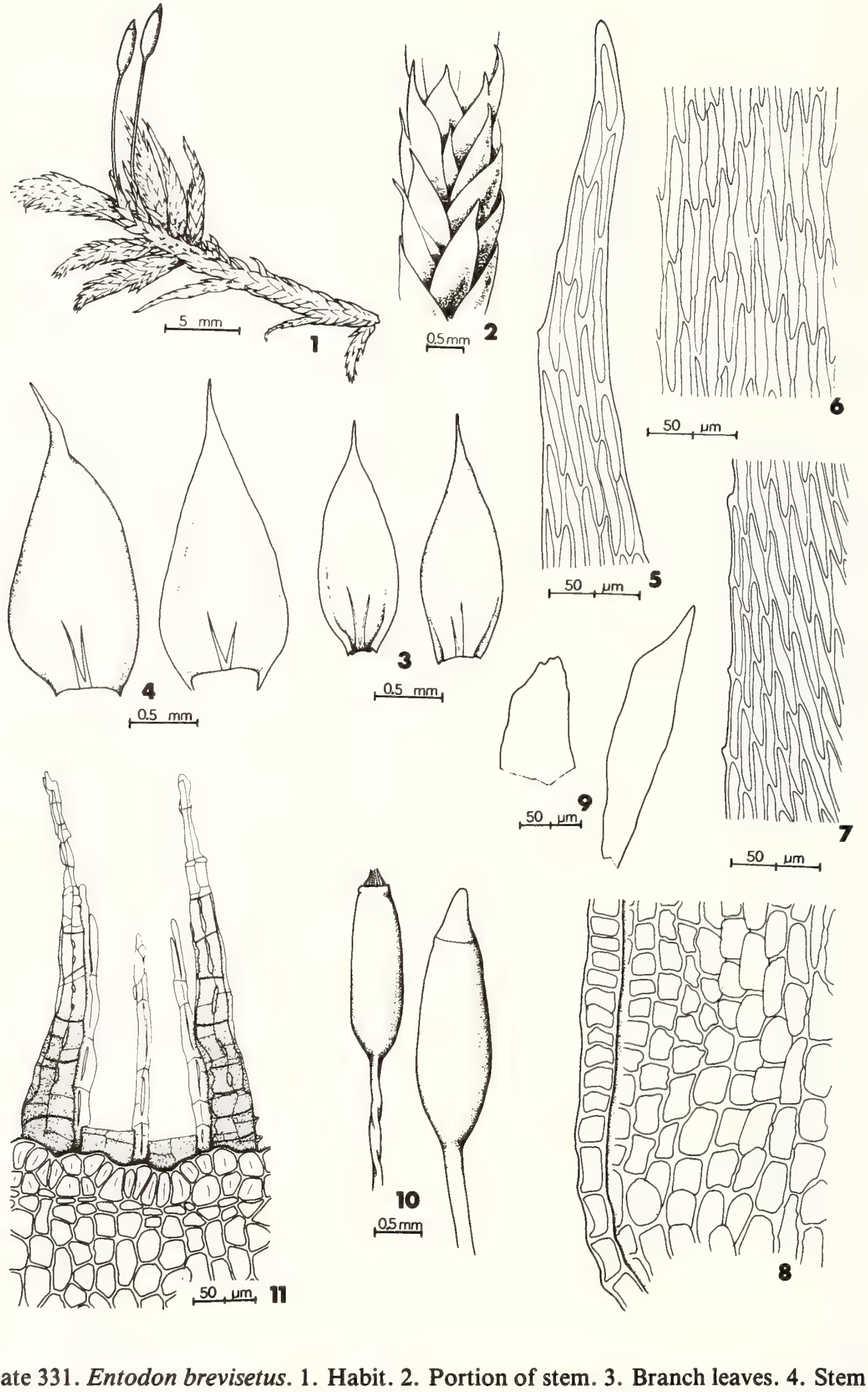
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Plate 331. *Entodon brevisetus*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllia. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome teeth.

2. **Pleurozium** Mitt., J. Linn. Soc. Bot. 12: 537. 1869. *nom. cons.*

Habit: In prostrate, loose mats.

Colour: Light green to yellowish green, brown below, glossy.

Stems: 6–15 cm long, red, prostrate, pinnately branched, epidermal cells small and thick-walled in cross-section, branches attenuate, rhizoids smooth or minutely papillose, sparse, in clusters at base of stems and tips of branches. Pseudoparaphyllia foliose, orbicular, sometimes lacking.

Leaves: Stem leaves erect, loosely imbricate, somewhat plicate when dry, concave, oblong-ovate, obtuse, apices recurved, shortly decurrent, branch leaves similar except apices abruptly obtuse. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane, often recurved at base, broadly incurved above, crenulate to serrulate at the apex.

Costae: Double, extending a short distance above base of leaf.

Leaf Cells: Smooth, the walls thick, pitted at base. Median cells fusiform to vermicular, becoming shorter and broader near apex and base, alar cells differentiated, orange, somewhat inflated, quadrate to oblong.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck and contracted under mouth when dry.

Setae: Straight to somewhat flexuose, smooth, often twisted when dry, red.

Annuli: Lacking.

Opercula: Conic, apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow to brown, endostome hyaline, 2–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose, minutely papillose, 10–19 μm.

1. **Pleurozium schreberi** (Brid.) Mitt., J. Linn. Soc. Bot. 12: 537. 1869.

Hypnum schreberi Brid., Musc. Rec. 2(2): 88. 1801.

[Synonym: *Calliergonella schreberi* (Brid.) Grout]

PLATE 332

Plants prostrate to suberect, light green to yellowish green, large, stems 6–15 cm long, red, pinnately branched, leaves loosely imbricate, concave, oblong-ovate, obtuse, branch leaves abruptly so, serrulate at apices, costae short and double, median cells fusiform to vermicular, alar cells differentiated, orange, somewhat inflated, quadrate to oblong, pitted; dioicous, seldom fruiting, setae red, capsules oblong-cylindric, arcuate, inclined to horizontal, smooth.

Habitat: On humus and soil in woods, occasionally in bogs, sometimes occurring on stumps.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, Northumberland, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to North Carolina, Tennessee, Arkansas, South Dakota, Colorado, Idaho, and Oregon. South America, Europe, Asia.

Chromosome Number: n = 5, 7.

Remarks: An extremely common species that is easily recognized in the field because of the robust, pinnately branched, red stems with loosely imbricate, concave leaves which are obtuse at the apex and have a short, double costa.

Commonly known as the "Red-Stemmed Feather Moss".

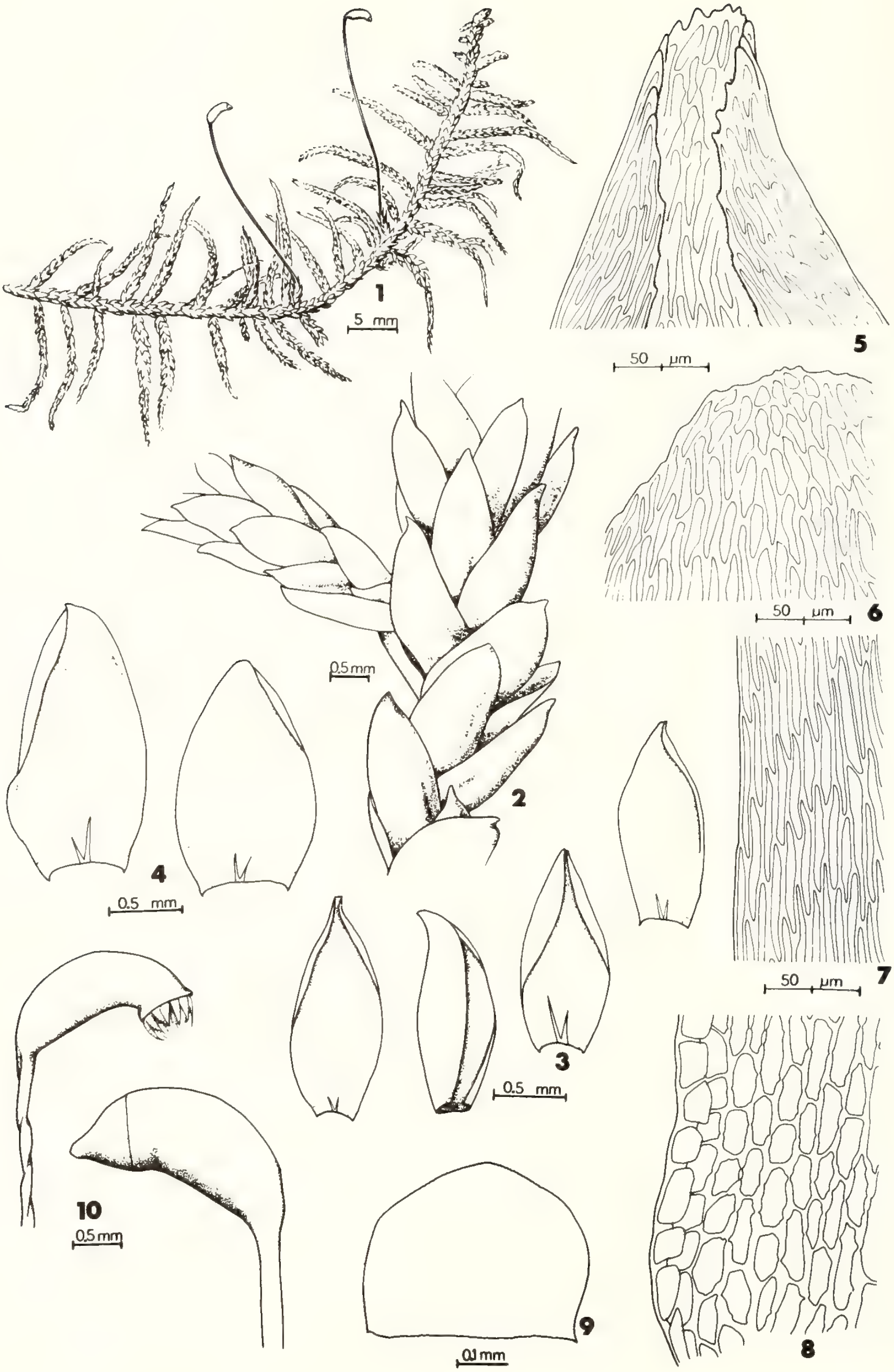
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Plate 332. *Pleurozium schreberi*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5. Apical cells of branch leaf. 6–8. Cells of stem leaf (6, apical. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllium. 10. Capsules, operculate (wet), inoperculate (dry).

Family PLAGIOTHECIACEAE

Plagiothecium B.S.G., Bryol. Eur. 5: 179. 1851 (fasc. 48 Mon. 1).

Habit: In prostrate, loose to dense mats, occasionally in erect tufts.

Colour: Dark green to yellowish green, dull to glossy.

Stems: 2–4 cm long, prostrate or sometimes erect, companate to julaceous, simple or sparingly and irregularly branched, epidermal cells large and thin-walled in cross-section, rhizoids smooth or minutely papillose, present at base of stems, branches and sex buds or on stems just below juncture of leaves directly below costae.

Leaves: Stem and branch leaves similar, erect or erect-spreading, sometimes shriveled when dry, flat to concave, ovate-lanceolate, oblong-lanceolate or oblong-ovate, acute to acuminate, decurrent. Perichaetial leaves sheathing base of seta, oblong-lanceolate, acuminate.

Leaf Margins: Plane or recurved to leaf middle or above, entire or serrulate to serrate at apex.

Costae: Double, one branch often reaching $^1/_3$–$^1/_2$ the leaf length, rhizoids smooth or minutely papillose, arising from dorsal surface, primarily on lower leaves.

Leaf Cells: Smooth, the walls of medium thickness, often pitted at base of leaf. Median cells fusiform to vermicular, becoming quadrate, rectangular or spherical and inflated in the decurrent alar regions.

Asexual Reproductive Bodies: Cylindrical or fusiform, 2–7 celled, smooth, uniseriate bodies often present, borne of stalks, clustered in leaf axils or on dorsal surface of leaf apices (*P. latebricola*).

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered at base of stems, brown to reddish brown, oblong- to ovoid-cylindric, straight to arcuate, erect to horizontal, smooth, sometimes striate or wrinkled when dry.

Setae: Straight to flexuose, smooth, twisted when dry, brown to reddish brown.

Annuli: 2–3 rows of deciduous cells or of 1–2 rows of persistent cells (*P. latebricola*).

Opercula: Conic to rostrate, straight to slightly arcuate.

Peristomes: Double, hypnaceous, exostome yellow to light brown, endostome hyaline, 1–3 cilia, nodulose, sometimes cilia lacking.

Spores: Yellow to yellowish brown, globose to ovoid, smooth or minutely papillose, 9–14 μm in longest dimension.

Ireland (1969b) studied the North American taxa of *Plagiothecium*.

1. Leaves with broadly recurved margins; decurrent portion of leaves often auriculate, rounded at the ends, composed of many inflated, spherical cells in 2–8 vertical rows; capsules striate or wrinkled when dry .... 4. *P. denticulatum*
1. Leaves with plane or narrowly recurved margins; decurrent portion of leaves never auriculate, tapering to pointed ends, composed of mostly rectangular cells in 1–5 vertical rows; capsules smooth or sometimes striate or wrinkled when dry 2
    2. Plants small, leaves erect-spreading, mostly 1 mm or less long; dioicous; rare, on bases of trees, rotten wood and fern tussocks in wet lowlands .... 1. *P. latebricola*
    2. Plants larger, leaves mostly more than 1.5 mm long; autoicous or dioicous; common at low or high altitudes on various substrata 3
        3. Median cells of leaves 10 μm wide or less; plants usually complanate-foliate, often with undulate, flat, asymmetric leaves without recurved apices or sometimes leaves smooth, secund with apices pointing toward substratum; autoicous .... 3. *P. laetum*
        3. Median cells of leaves often over 10 μm wide; plants usually julaceous, sometimes somewhat complanate, with symmetric, concave leaves with apices often recurved; dioicous .... 2. *P. cavifolium*

1. **Plagiothecium latebricola** B.S.G., Bryol. Eur. 5: 184. 494. 1851 (fasc. 48 Mon. 6.1).
PLATE 333

Dioicous plants that are small, leaves seldom over 1 mm long, erect-spreading, moderately complanate, mostly symmetric, margins plane or narrowly recurved, decurrent cells rectangular and capsules rarely produced, erect and smooth.

Habitat: On bases of trees, rotten stumps and fern tussocks, in wet habitats, such as swamps, fens, marshes, etc.

Maritime Distribution: Rare. New Brunswick (Albert); Nova Scotia (Colchester, Kings, Lunenburg).

Range: *Labrador to Ontario, south to New Jersey, Michigan, and Wisconsin. Europe.

Chromosome Number: Unreported.

Remarks: Sometimes mistaken for *P. laetum* from which it essentially differs from the autoicous plants of that species by its dioicous plants that are only moderately complanate and by the gemmae that occur on the dorsal surface of the leaf apices.

Crundwell (1979) recently studied the rhizoids in the Plagiotheciaceae and discovered that they are of use in the taxonomy. He reported that the rhizoids are always stem-borne in *P. latebricola* whereas in most other *Plagiothecium* species they arise from the leaves, from cells on or beside the midrib or rarely on the stem just below the origin of the leaf. His findings accurately describe the situation in *P. cavifolium, P. denticulatum* and *P. laetum* which have rhizoids primarily on the dorsal surface of the costae. However, in *P. latebricola* many of the rhizoids are on the stem near the leaf origin but some are also found on the costae, only not to the extent that they are in the other species.

2. **Plagiothecium cavifolium** (Brid.) Iwats., J. Hattori Bot. Lab. 33: 360. 1970.
Hypnum cavifolium Brid., Bryol. Univ. 2: 556. 1827.
[Synonyms: *P. aciculari-pungens* C. Müll. & Kindb. *ex* Mac. & Kindb.; *P. roeseanum* B.S.G.]
PLATE 334

Dioicous, commonly julaceous or sometimes somewhat complanate plants that are medium-sized, leaves 1–3 mm long, concave or rarely almost flat, symmetric, apices usually recurved, margins plane or narrowly recurved and capsules erect to inclined, smooth to wrinkled or striate when dry.

Habitat: On soil over cliff ledges, on stumps, rotten wood, clay banks and humus in woods.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Pictou, Shelburne, Victoria); Prince Edward Island (Queens).

Range: In eastern North America from Greenland to Ontario, south to Georgia, Tennessee, and Arkansas; in the West from Alaska to Washington; also in the Yukon Territory, Colorado, and Idaho. Europe, Asia.

Chromosome Number: n = 10, 11, 20.

Remarks: *Plagiothecium sylvaticum* (Brid.) B.S.G. is predominantly a European species that has often been reported for the Maritimes and most collections thus named are *P. cavifolium*.

3. **Plagiothecium laetum** B.S.G., Bryol. Eur. 5: 185. 495. 1851 (fasc. 48 Mon. 7.2).
PLATE 335

Autoicous plants that are medium-sized to small, leaves 0.8–2.5 mm long, flat or rarely somewhat concave, usually asymmetric, margins plane or narrowly recurved, decurrent cells rectangular and capsules erect to inclined, smooth.

Habitat: On rotten logs, stumps, bases of trees, humus and soil on steep banks and over boulders and cliffs in woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, Madawaska, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: *Greenland to Alaska, south to North Carolina, Tennessee, Iowa, New Mexico, and California. Europe, *Asia, New Zealand.

Chromosome Number: n = 10, 11.

Remarks: Often confused with *P. denticulatum* from which it differs macroscopically by the smaller plants with plane to narrowly recurved leaf margins and the smooth capsules. Microscopically it differs by the narrower leaf cells (*P. laetum*: 5–10 μm; *P. denticulatum*: 12–20 μm) and the presence of only rectangular cells in the decurrent leaf bases. There is a tendency for *P. laetum* to occur in somewhat drier habitats than *P. denticulatum*. *P. cavifolium* and *P. latebricola* are also occasionally confused with *P. laetum* but the characters used in the key will distinguish them.

4. Plagiothecium denticulatum (Hedw.) B.S.G., Bryol. Eur. 5: 190. 501. 1851 (fasc. 48 Mon. 12.8).

Hypnum denticulatum Hedw., Spec. Musc. 237. 1801.

PLATE 336

Recognized from the others in the genus by the autoicous plants with large, complanate stems and branches, the imbricate, asymmetric leaves with broadly recurved margins, the inflated, spherical, decurrent leaf cells and the capsules that are horizontal and striate or wrinkled when dry.

Habitat: Often in wet woods on rotten logs, soil, humus and rarely on rocks.

Maritime Distribution: Common. New Brunswick (Albert, Kent, Northumberland, Restigouche, York); Nova Scotia (Cape Breton, Colchester, Digby, Halifax, Hants, Inverness); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to North Carolina, Tennessee, Arkansas, New Mexico, and California. Mexico, *Central and *South America, Europe, *Asia, *Africa, *Australia, Pacific Islands.

Chromosome Number: n = 10, 11, 20, 25.

Remarks: See *P. laetum*.

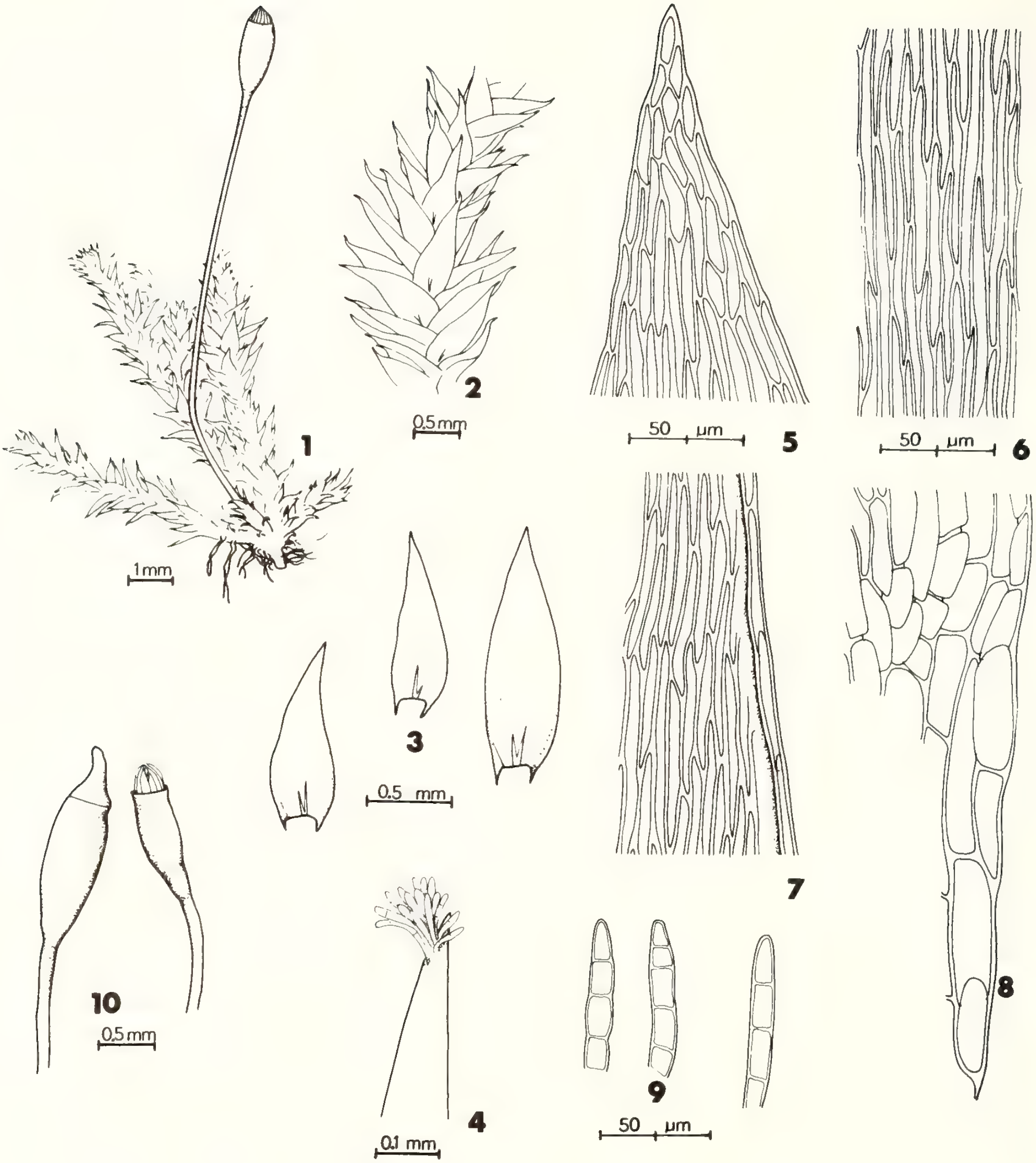
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Plate 333. *Plagiothecium latebricola*. 1. Habit. 2. Portion of stem. 3. Leaves. 4. Upper portion of leaf showing gemmae. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, decurrent alar cells.). 9. Gemmae. 10. Capsules, operculate (wet), inoperculate (dry).

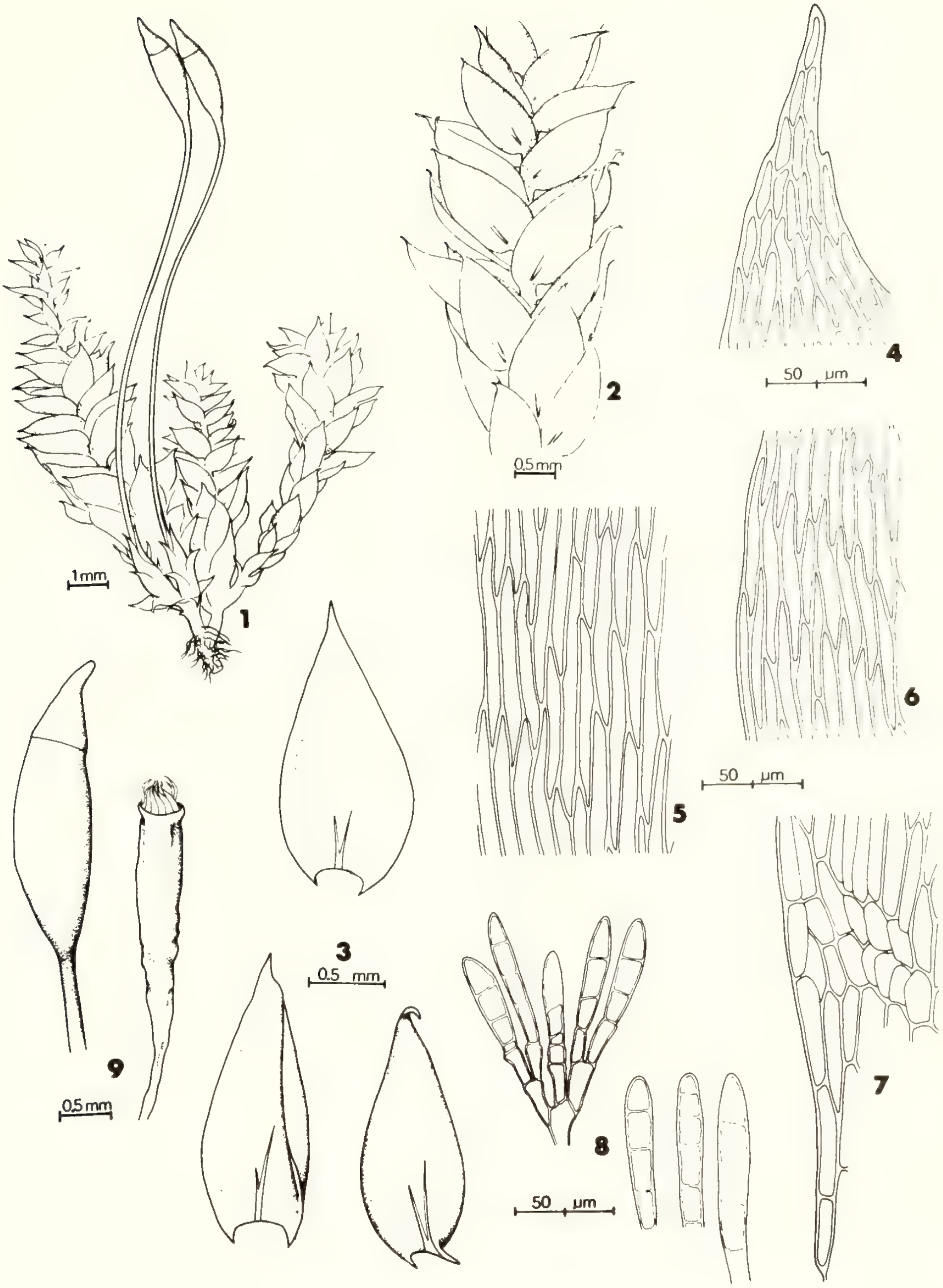
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Plate 334. *Plagiothecium cavifolium*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, decurrent alar cells.). 8. Gemmae. 9. Capsules, operculate (wet), inoperculate (dry).

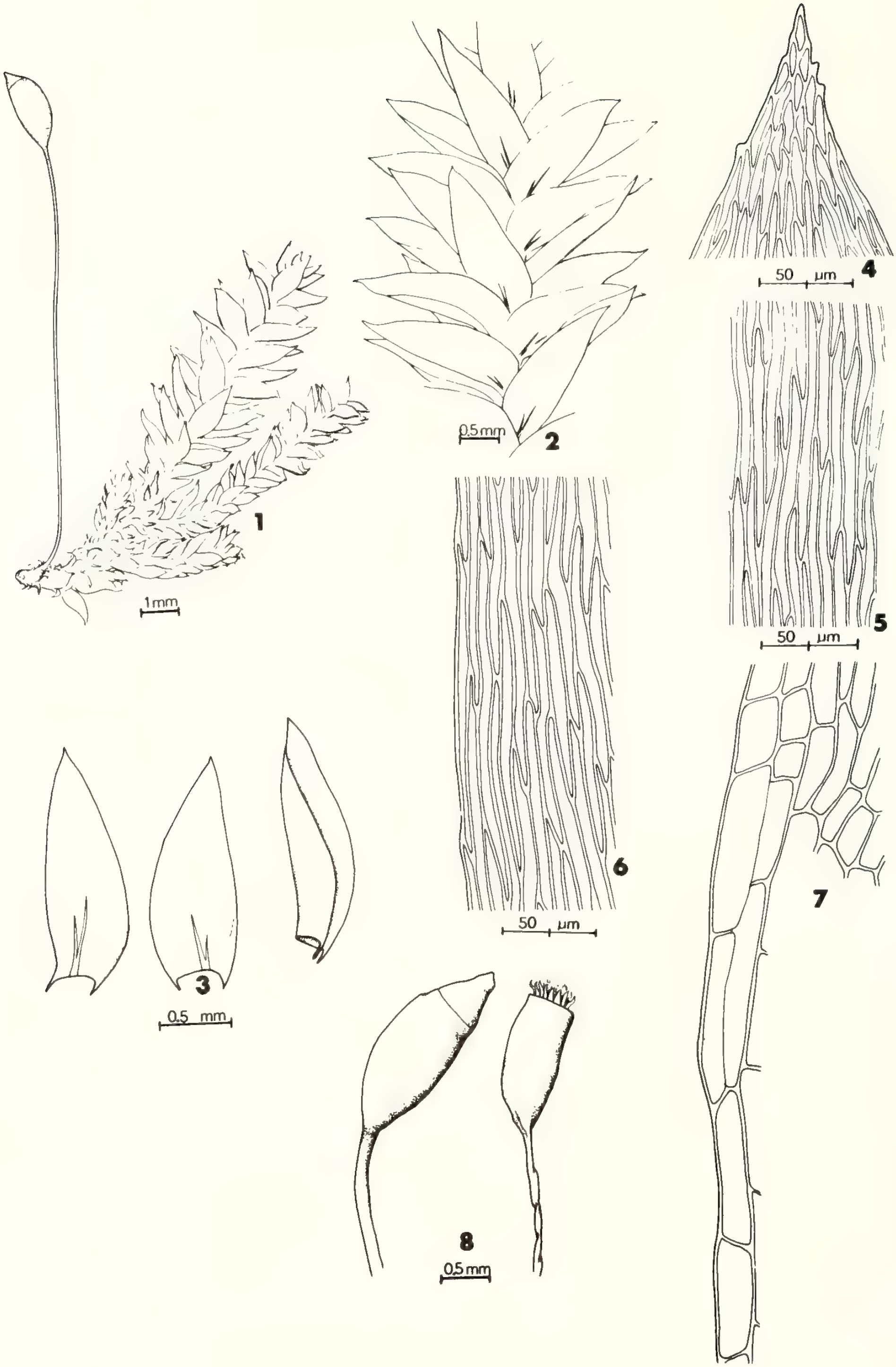
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Plate 335. *Plagiothecium laetum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, decurrent alar cells.). 8. Capsules, operculate (wet), inoperculate (dry).

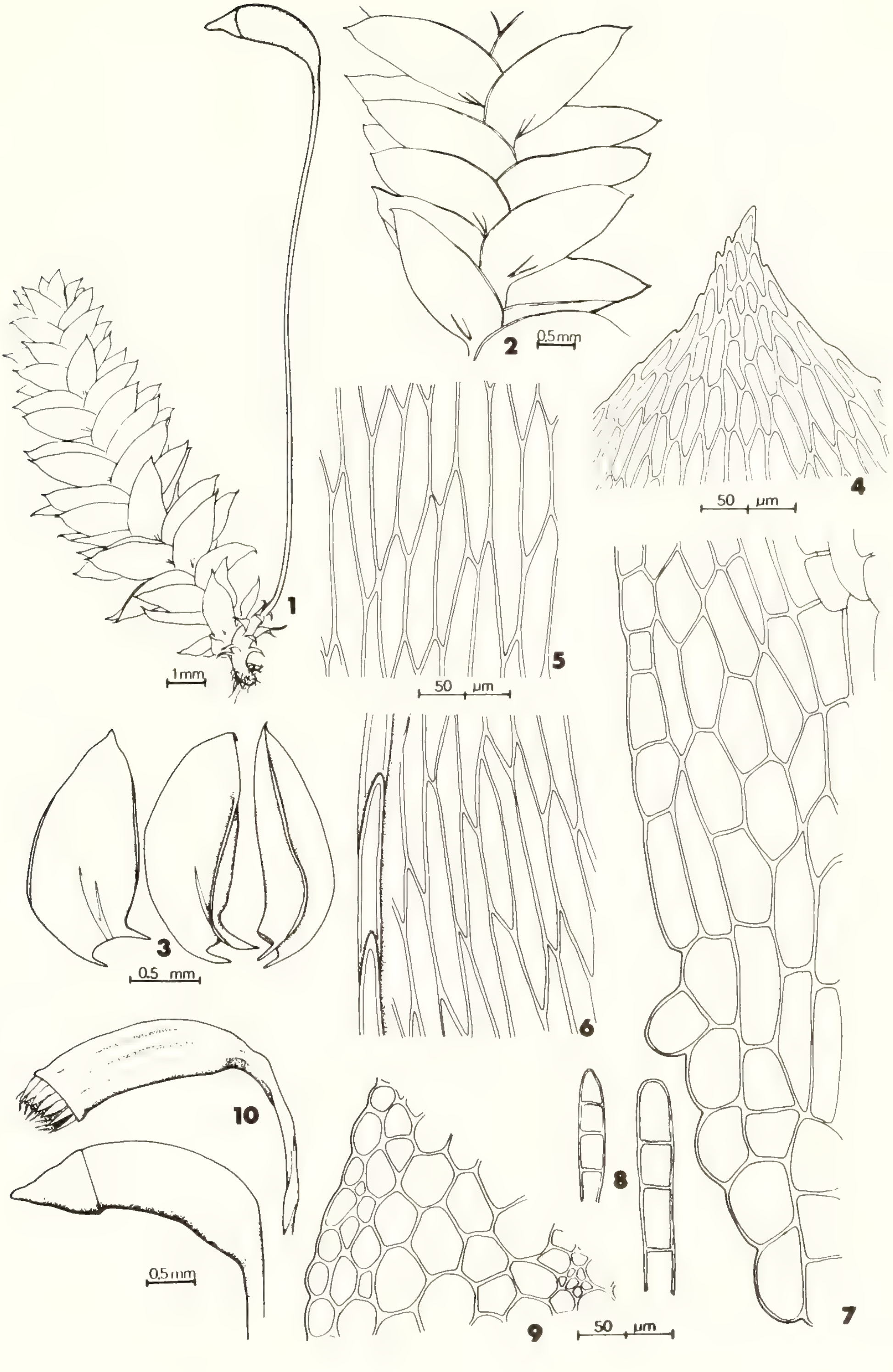
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Plate 336. *Plagiothecium denticulatum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, decurrent alar cells.). 8. Gemmae. 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

Family SEMATOPHYLLACEAE

1. Pseudoparaphyllia present, filamentous; exothecial cells noncollenchymatous .... 1. *Brotherella* (p. 588)
1. Pseudoparaphyllia lacking; exothecial cells collenchymatous .... 2. *Sematophyllum* (p. 590)

1. **Brotherella** Loeske *ex* Fleisch., Nova Guinea 12(2): 119. 1914.

Habit: In prostrate, dense mats.

Colour: Yellowish green to yellowish brown, glossy.

Stems: 2–5 cm long, orange or red, prostrate, slightly complanate, subpinnately branched, rhizoids smooth or minutely papillose, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia present, filamentous.

Leaves: Stem and branch leaves similar, falcate-secund, curved toward substrate, scarcely changed when dry, ovate- to oblong-lanceolate, acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane above, usually recurved below, serrate to serrulate from apex to middle of leaf.

Costae: Lacking.

Leaf Cells: Smooth, the walls of medium thickness, pitted at base of leaf. Median cells fusiform or vermicular, becoming quadrate, rectangular or spherical and inflated with a yellow or orange colour in alar regions.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, reddish brown, oblong-cylindric, inclined, smooth, contracted under mouth when dry, arcuate, exothecial cells not collenchymatous.

Setae: Straight to flexuose, smooth, twisted when dry, reddish brown.

Annuli: 2–3 rows of small cells, persistent.

Opercula: Long-rostrate, arcuate.

Peristomes: Double, hypnaceous, exostome yellow to orange, endostome hyaline, 1–2 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 12–17 μm in longest dimension.

1. **Brotherella recurvans** (Michx.) Fleisch., Nova Guinea 12(2): 120. 1914.
Leskea recurvans Michx., Fl. Bor. Amer. 2: 311. 1803.
[Synonyms: *B. delicatula* (James) Fleisch.; *Sematophyllum delicatulum* (James) Britt.; *S. recurvans* (Michx.) Britt.]
PLATE 337

Plants shiny, yellowish green to yellowish brown, subpinnately branched, stems and branches orange or red, slightly complanate, filamentous pseudoparaphyllia present, leaves falcate-secund, curved toward substrate, ovate- to oblong-lanceolate, acuminate, margins serrate above, costae lacking, alar cells enlarged and inflated, yellow to orange; dioicous, reddish brown setae and capsules, operculum long-rostrate, urn oblong-cylindric, inclined, arcuate, exothecial cells not collenchymatous.

Habitat: On rotten logs, bases of trees, humus and rock.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, King's, Madawaska, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Newfoundland to *Manitoba, south to Florida, Alabama, and Illinois; also in *British Columbia (?). *Japan.

Chromosome Number: n = 6, 7.

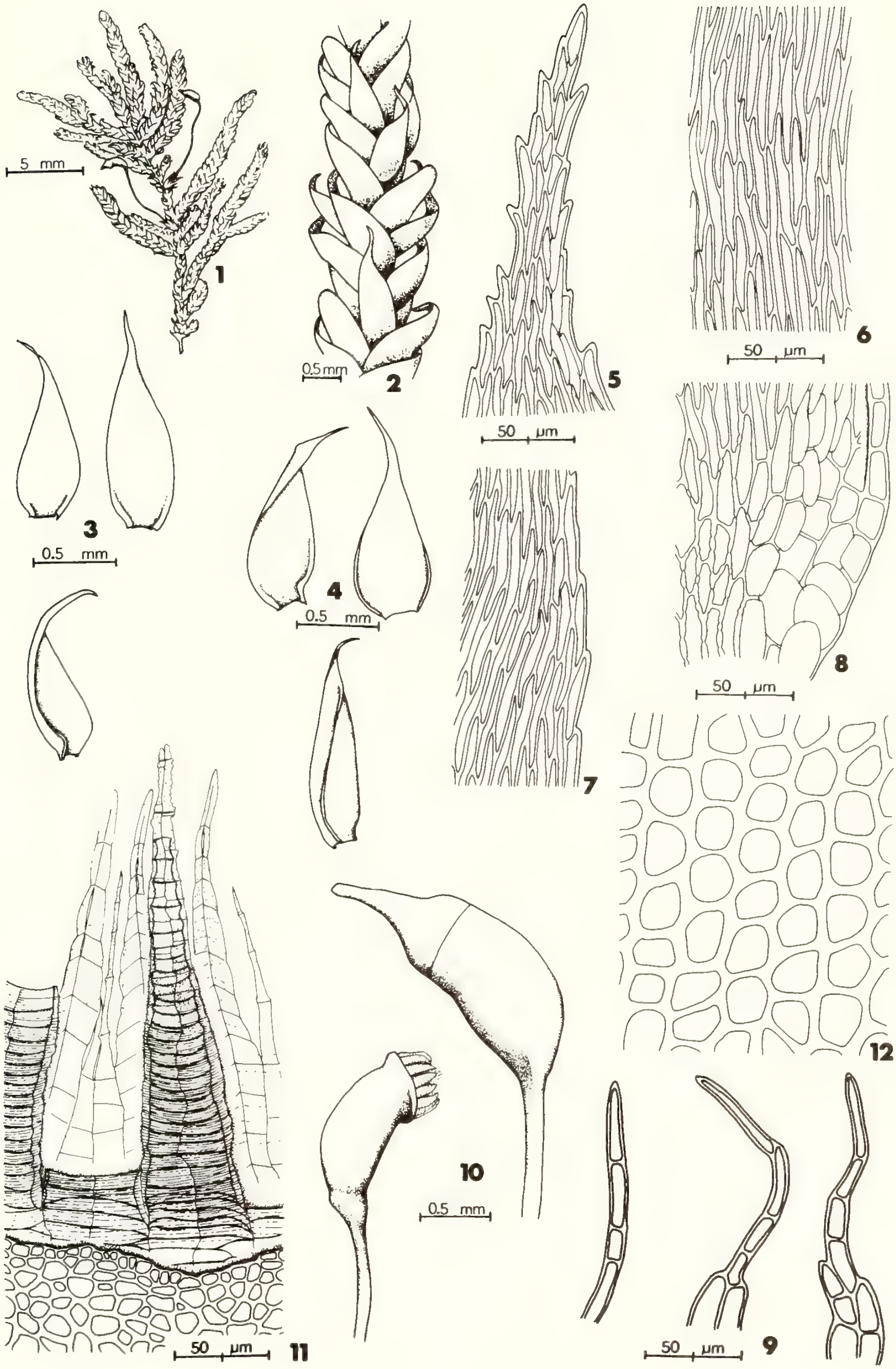
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Plate 337. *Brotherella recurvans*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllia. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome teeth. 12. Exothecial cells.

2. **Sematophyllum** Mitt., J. Linn. Soc. Bot. 8: 5. 1865.

Habit: In prostrate, dense mats.

Colour: Yellowish green to brownish green, glossy.

Stems: 2–5 cm long, orange or red, prostrate, somewhat julaceous, irregularly branched, rhizoids smooth or minutely papillose, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia lacking.

Leaves: Stem and branch leaves similar, erect to somewhat spreading, scarcely changed when dry, oblong to oblong-ovate, acute to acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, lanceolate, acuminate.

Leaf Margins: Plane or reflexed nearly to apex, entire to minutely serrulate above, entire below.

Costae: Short and double or lacking.

Leaf Cells: Smooth, the walls thick or of medium thickness, pitted at base and sometimes above. Median cells fusiform to vermicular, alar cells abruptly enlarged and inflated, quadrate, rectangular or spherical, hyaline, yellow or orange.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, ovoid to oblong-ovoid, inclined, smooth, contracted under mouth when dry, arcuate, exothecial cells collenchymatous.

Setae: Straight to flexuose, smooth, often twisted when dry, red.

Annuli: Lacking.

Opercula: Long-rostrate, arcuate.

Peristomes: Double, hypnaceous, exostome yellow to orange, endostome hyaline, 1–2 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 19–28 μm in longest dimension.

1. Leaves small, usually less than 1.5 mm long; apical leaf cells 3–5:1 .... 1. *S. demissum*
1. Leaves large, often 1.5 mm long or more; apical leaf cells 4–8:1 .... 2. *S. marylandicum*

1. Sematophyllum demissum (Wils.) Mitt., J. Linn. Soc. Bot. 8: 5. 1865.
Hypnum demissum Wils., Engl. Bot. Suppl. 2740. 1832.
[Synonym: *S. carolinianum* (C. Müll.) Britt.]
PLATE 338

Plants shiny, yellowish green to brownish green, irregularly branched, stems and branches somewhat julaceous, leaves 1.0–1.5 mm long, concave, erect to somewhat spreading, imbricate, oblong to oblong-ovate, acute, margins plane or reflexed nearly to apex, entire to minutely serrulate above, entire below, costae short and double or lacking, alar cells abruptly enlarged and inflated, hyaline, yellow or orange; autoicous, setae red, capsules brown to reddish brown, operculum long-rostrate, urn ovoid to oblong-ovoid, inclined, arcuate, exothecial cells collenchymatous.

Habitat: On bluff beside creek.

Maritime Distribution: Rare. Nova Scotia (Lunenburg). Collected 0.8 km north of New Germany, 44°33′N, 64°43′W, 22 July 1974 (*Ireland* 17691).

Range: *Newfoundland and Nova Scotia to *Quebec, south to Georgia, Tennessee, Louisiana, and Kansas. Europe, Asia, *Africa.

Chromosome Number: n = 11.

2. Sematophyllum marylandicum (C. Müll.) Britt., Bryologist 5(4): 66. 1902.
Hypnum marylandicum C. Müll., Syn. 2: 328. 1851.
PLATE 339

Plants similar to *S. demissum* except larger, leaves 1.5–2.0 mm long, apices acute to acuminate with longer apical cells.

Habitat: On boulders beside and in creeks and at margins of lakes.

Maritime Distribution: Rare. Nova Scotia (Halifax, Victoria).

Range: Endemic to North America, from Newfoundland and Nova Scotia to *Quebec, south to *Georgia and Tennessee.

Chromosome Number: n = 11.

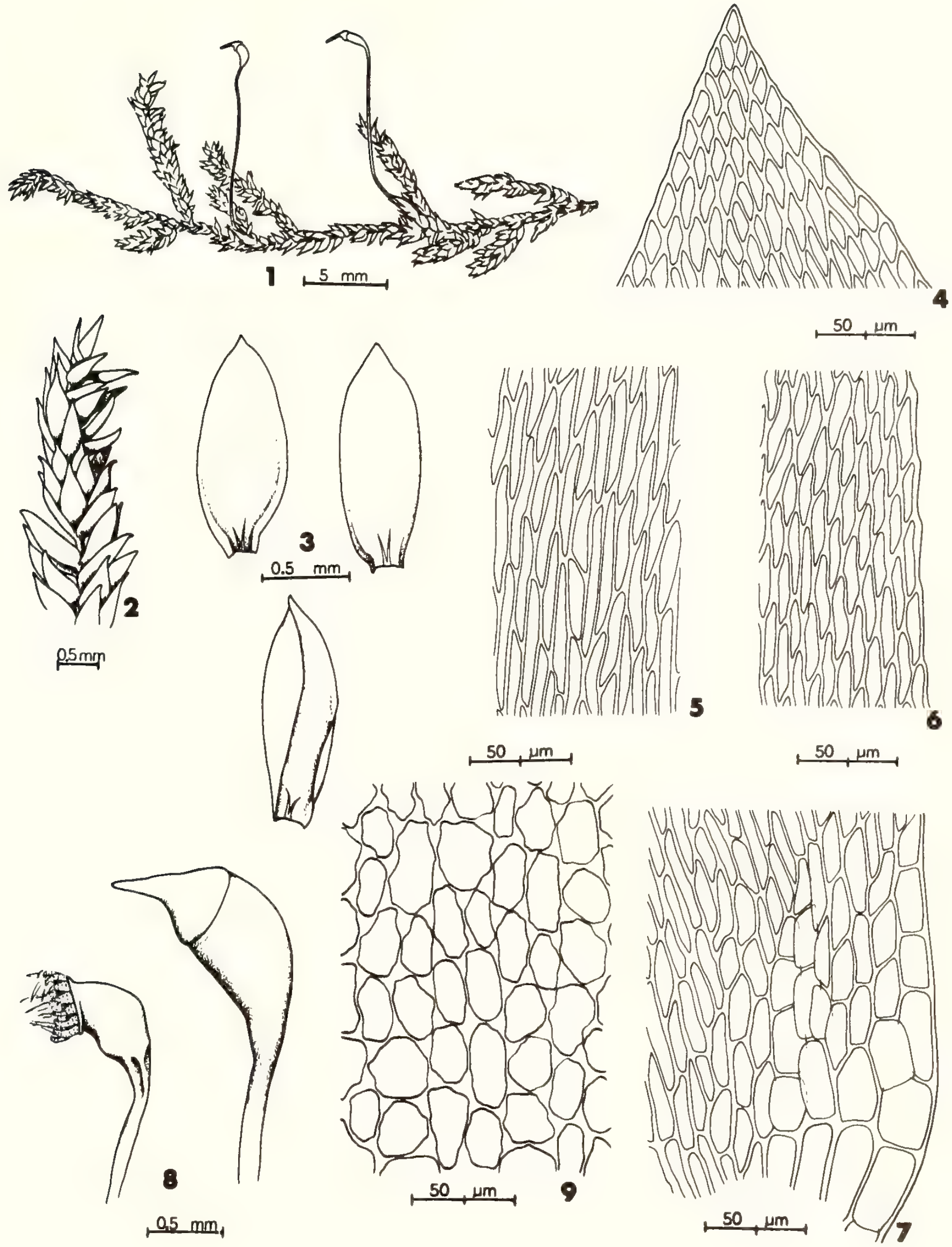
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Plate 338. *Sematophyllum demissum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Exothecial cells.

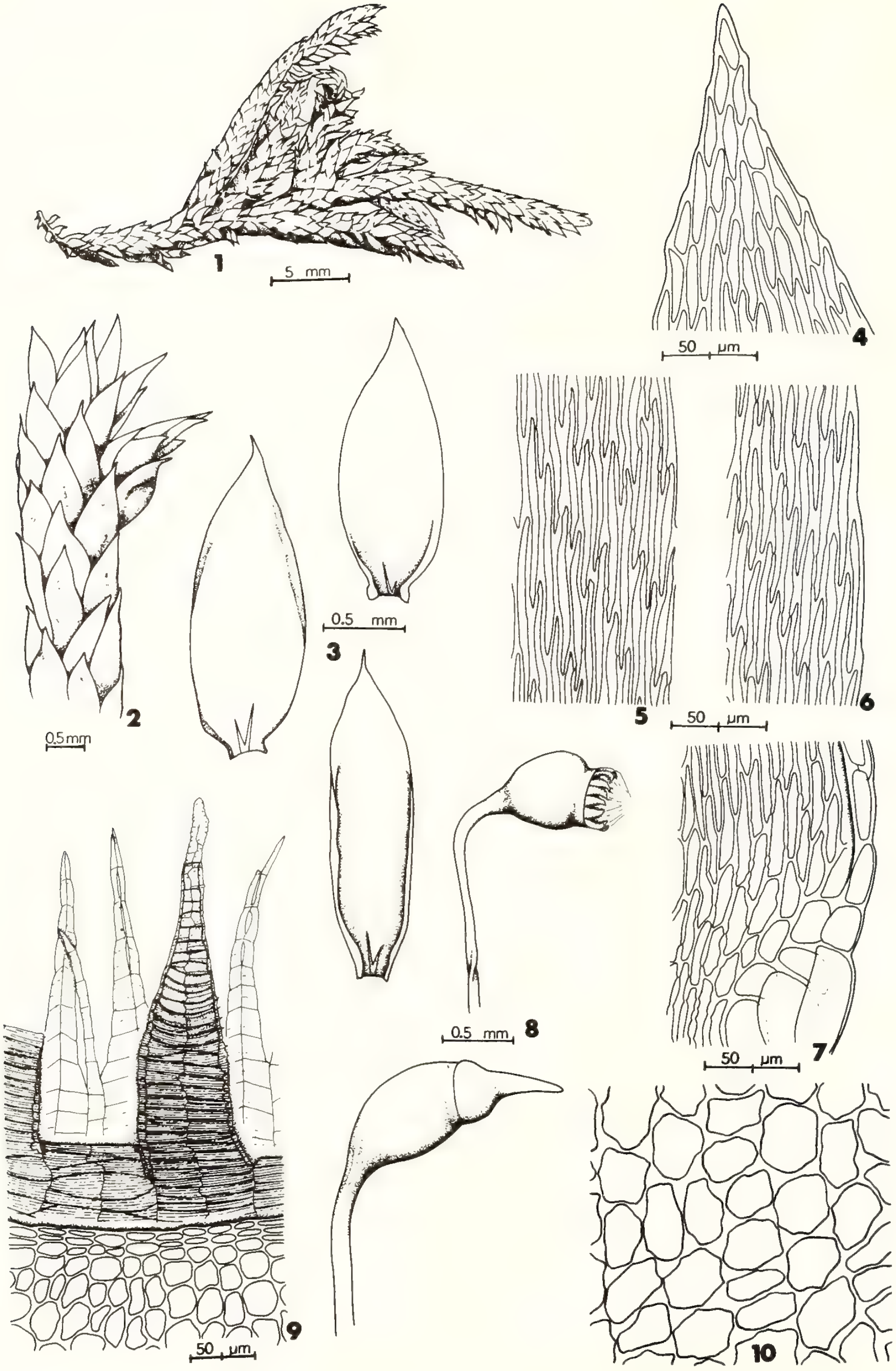
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Plate 339. *Sematophyllum marylandicum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Capsules, operculate (wet), inoperculate (dry). 9. Peristome teeth. 10. Exothecial cells.

Family HYPNACEAE

1. Stems suberect, pinnate, plumose; leaves strongly plicate .... 10. *Ptilium* (p. 636)
1. Stems prostrate, irregularly branched to pinnate but not plumose; leaves smooth or undulate 2
  2. Leaf cells prorate on dorsal surface .... 9. *Ctenidium* (p. 634)
  2. Leaf cells smooth or rarely minutely prorate on dorsal surface 3
    3. Branches with clusters of stubby, brood branchlets in axils of upper leaves .... 1. *Platygyrium* (p. 593)
    3. Branches lacking stubby, brood branchlets but elongate branchlets sometimes present 4
      4. Pseudoparaphyllia filamentous or lacking 5
        5. Leaves sometimes decurrent, margins strongly serrate to serrulate in upper half; capsules striate when dry .... 8. *Herzogiella* (p. 630)
        5. Leaves nondecurrent, margins entire to serrulate in upper half or, if serrate, stems with large asexual reproductive bodies; capsules smooth or wrinkled when dry 6
          6. Plants complanate-foliate or nearly so; leaves mostly straight; various types of asexual reproductive bodies often present on stems .... 6. *Isopterygium* (p. 620)
          6. Plants rarely complanate; leaves usually falcate-secund toward substrate; asexual reproductive bodies lacking .... 5. *Hypnum* (in part) (p. 605)
      4. Pseudoparaphyllia foliose 7
        7. Leaves short, less than 1 mm long; median leaf cells short, nearly rhomboidal, rarely over 6:1 .... 3. *Homomallium* (p. 601)
        7. Leaves longer, mostly 1 mm long or more; median leaf cells long, usually over 6:1 8
          8. Leaves entire or rarely serrulate near apex; alar cells enlarged and inflated, yellowish .... 4. *Callicladium* (p. 603)
          8. Leaves serrulate to serrate near apex, rarely entire; alar cells quadrate, rectangular or rounded, seldom yellowish 9
            9. Plants complanate-foliate; dioicous, sporophytes unknown on Maritime plants .... 7. *Taxiphyllum* (p. 628)
            9. Plants not complanate; autoicous or dioicous, sporophytes often present 10
              10. Leaves usually falcate-secund toward substrate; stems with a braided appearance; pseudoparaphyllia conspicuous, often large and incised; capsules usually inclined to horizontal, arcuate or rarely straight .... 5. *Hypnum* (in part) (p. 605)
              10. Leaves mostly straight, sometimes falcate-secund; stems without braided appearance; pseudoparaphyllia indistinct, small and entire; capsules erect and straight .... 2. *Pylaisiella* (p. 596)

1. **Platygyrium** B.S.G., Bryol. Eur. 5: 95. 1851 (fasc. 46–47 Mon. 1). *nom. cons.*

Habit: Prostrate, with ascending branches, in dense mats.

Colour: Green, yellowish- or brownish-green, glossy.

Stems: 2–5 cm long, creeping, subpinnately to pinnately branched, branches ascending, often arcuate near tips, epidermal cells small and thick-walled in cross-section, rhizoids numerous, papillose, just below juncture of leaves on ventral surface of stems and branches. Pseudoparaphyllia foliose, lanceolate, sometimes bifid.

Leaves: Stem and branch leaves similar except in size, close, imbricate, concave, smooth, erect-spreading, unchanged when dry, straight or often falcate-secund at branch tips, ovate or oblong-lanceolate, acuminate, nondecurrent or 1–2 cells decurrent. Perichaetial leaves sheathing base of seta, elongate, oblong-lanceolate, squarrose at tips, smooth.

Leaf Margins: Recurved from base to middle or above, entire to serrulate above leaf middle, entire below.

Costae: Double, extending a short distance above base, sometimes lacking.

Leaf Cells: Smooth, the walls of medium thickness or thick, basal cells pitted, sometimes median cells pitted. Median cells fusiform, vermicular or somewhat rhomboidal, rhomboidal near apex, alar cells quadrate, short-rectangular, transversely elongate or irregularly angled, numerous, 8–15 in marginal row.

Asexual Reproductive Bodies: Commonly present as dense clusters of small, dark, brood branchlets in axils of upper branch leaves, 0.2–0.6 mm long.

Sex: Dioicous.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, yellowish to brown, cylindric or nearly so, straight, occasionally asymmetric, erect, smooth, scarcely changed when dry.

Setae: Straight to somewhat flexuose, smooth, not or somewhat twisted when dry, orange to red.

Annuli: 2–3 rows of small cells, persistent.

Opercula: High-conic to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellowish, endostome hyaline, cilia lacking.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–17 μm in longest dimension.

1. **Platygyrium repens** (Brid.) B.S.G., Bryol. Eur. 5: 98. 458. 1851 (fasc. 46–47 Mon. 4.1).

Pterigynandrum repens Brid., Spec. Musc. 1: 131. 1806.

PLATE 340

Plants small to medium-sized, in dense, green, yellowish- or brownish-green, flat mats, stems subpinnately to pinnately branched, up to 5 cm long, branches ascending, often arcuate near tips, leaves 0.8–1.5 mm long, ovate or oblong-lanceolate, acuminate, often falcate-secund at branch tips, smooth, margins recurved from base to middle or above, entire or serrulate above leaf middle, leaf cells smooth, median fusiform, vermicular or slightly rhomboidal, alar quadrate, short-rectangular, transversely elongate or irregularly angled, 8–15 in marginal row, costae short and double, sometimes lacking, asexual reproductive bodies usually present near apices of stems and branches, small, brood branchlets clustered in leaf axils; dioicous, setae straight, orange to red, 1–2 cm long, capsules cylindric or nearly so, straight, occasionally asymmetric, erect, yellowish to brown, 1.5–2.5 mm long.

Habitat: On tree trunks, rotten logs and stumps.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Madawaska, Queen's, Victoria, York); Nova Scotia (Annapolis, Colchester, Digby, Halifax, Hants, Lunenburg, Pictou, Queens); Prince Edward Island (Kings, Queens).

Range: Newfoundland to Manitoba, south to Florida, Alabama, Louisiana, and Kansas; also in Alberta and British Columbia. *West Indies, Europe, Asia, *Africa.

Chromosome Number: Unreported.

Remarks: Best recognized by the clusters of brood branchlets near the apices of the stems and branches. The branchlets serve as a means of asexual reproduction.

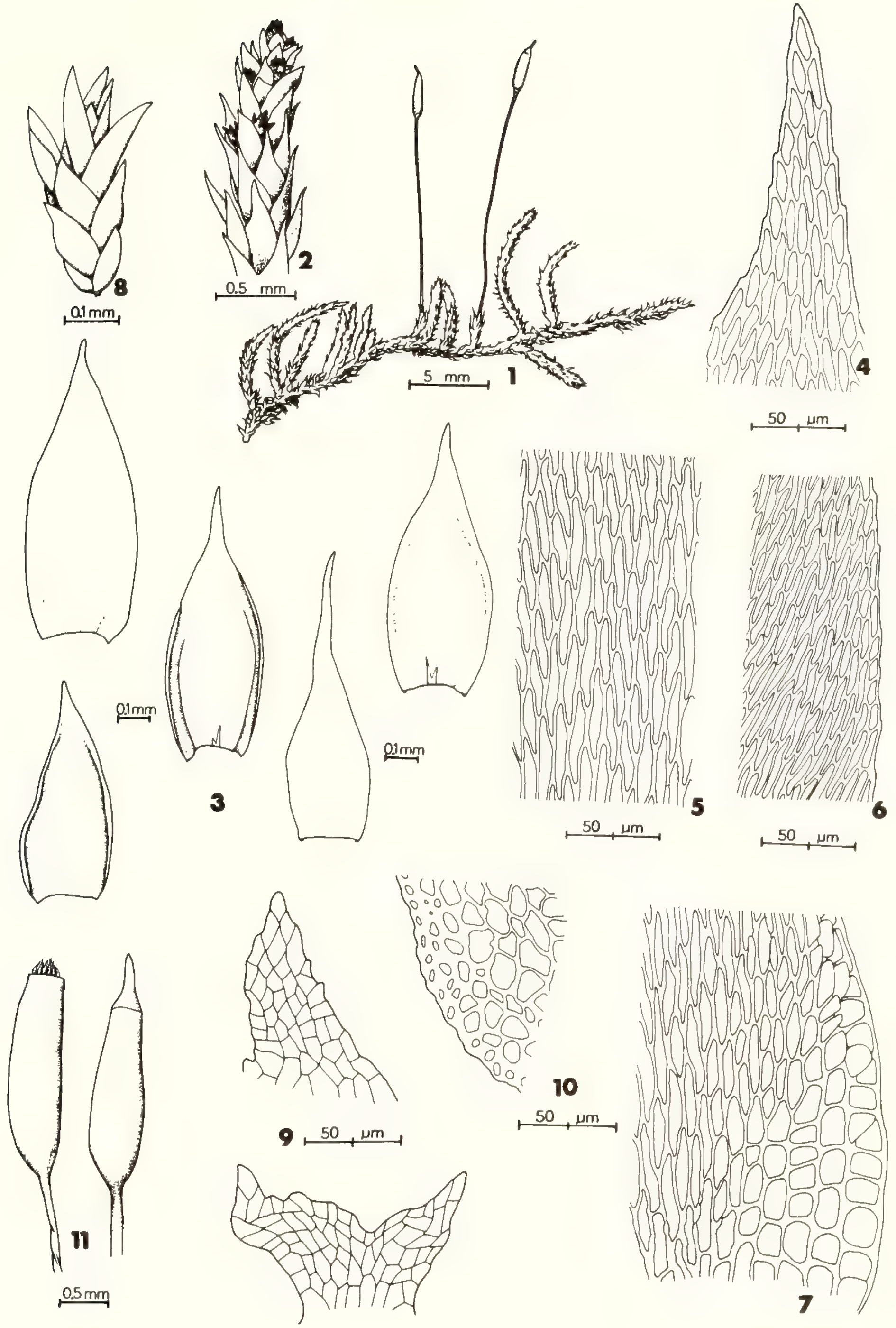
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Plate 340. *Platygyrium repens*. 1. Habit. 2. Portion of branch apex. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Asexual brood branchlet. 9. Pseudoparaphyllia. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

2. **Pylaisiella** Kindb. *ex* Grout, Bull. Torrey Bot. Cl. 23: 228. 1896.
[Synonym: *Pylaisia* B.S.G.]

Habit: Prostrate, with ascending, usually curved, branches, in dense mats.
Colour: Green to yellowish- or brownish-green, glossy.
Stems: 2–5 cm long, creeping, irregularly or subpinnately branched, branches ascending, arcuate, especially near tips when dry, epidermal cells small and thick-walled in cross-section, rhizoids numerous, smooth, in clusters just below juncture of leaves on ventral surface of stems and branches. Pseudoparaphyllia foliose, lanceolate.
Leaves: Stem and branch leaves similar, close, concave, smooth, erect-spreading, straight or often falcate-secund, unchanged when dry, ovate or oblong-lanceolate, acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, ovate- or oblong-lanceolate, long-acuminate, spreading at tips, smooth.
Leaf Margins: Plane, entire or serrulate.
Costae: Double, extending a short distance above base, sometimes lacking.
Leaf Cells: Smooth, the walls of medium thickness or thick, pits in basal and median cells or lacking. Median cells fusiform or vermicular, alar cells quadrate, rectangular or transversely elongate, often numerous, 5–15 in marginal row.
Asexual Reproductive Bodies: Lacking.
Sex: Autoicous.
Calyptrae: Cucullate, naked, white to yellow.
Capsules: Solitary, on setae scattered along stems, brown to reddish brown, ovoid or oblong-cylindric, straight, erect, smooth, scarcely changed or sometimes slightly contracted below mouth and wrinkled at neck when dry.
Setae: Straight to flexuose, smooth, not or somewhat twisted when dry, yellow, brown or reddish brown.
Annuli: 1-3 rows of cells, deciduous or persistent, sometimes lacking.
Opercula: Conic to short-rostrate, straight to arcuate.
Peristomes: Double, hypnaceous, exostome yellow to orange, endostome hyaline, segments of endostome sometimes fused to exostome segments, cilia lacking, sometimes rudimentary.
Spores: Green, greenish yellow or yellow, globose to ovoid, papillose, 10–31 μm in longest dimension.

1. Margins of leaves noticeably serrulate throughout, rarely entire; transversely rectangular or quadrate alar cells commonly in a few rows, most leaves with less than 10 on margins and less than 30 in entire alar region; spores averaging more than 19 μm in longest dimension . . . . 2. *P. intricata*
1. Margins of leaves entire or serrulate above; transversely rectangular or quadrate alar cells in several rows, many leaves with more than 10 on margins and about 50–60 in entire alar region; spores averaging 19 μm or less in longest dimension 2
    2. Leaves straight and erect, some rarely falcate-secund . . . . 3. *P. polyantha*
    2. Leaves falcate-secund, especially at stem and branch tips and when dry . . . . . 1. *P. selwynii*

1. Pylaisiella selwynii (Kindb.) Crum, Steere & Anders., Bryologist 67(2): 164. 1964.
Pylaisia selwynii Kindb., Ottawa Natural. 2: 156. 1889 ["-i"].
[Synonym: *Pylaisia schimperi* Card.]
PLATE 341

Close to *P. polyantha* and differing primarily in the strongly falcate-secund leaves with more numerous quadrate and rectangular cells on the basal margins. The spores are also somewhat larger, 12–24 μm in longest dimension.
Habitat: On tree trunks.
Maritime Distribution: Frequent. New Brunswick (Victoria); Nova Scotia (Annapolis, Inverness, Victoria); Prince Edward Island (Queens).
Range: *Labrador to Alaska, south to Virginia, Kentucky, and Arkansas; also in Arizona. Mexico, *Europe, Asia.
Chromosome Number: n = 11.
Remarks: See *P. intricata*.

2. Pylaisiella intricata (Hedw.) Grout, Bull. Torrey Bot. Cl. 23: 231. 1896.

Pterigynandrum intricatum Hedw., Spec. Musc. 85. 1801.

[Synonym: *Pylaisia intricata* (Hedw.) Schimp.]

PLATE 342

The leaves, mostly falcate-secund, with margins serrulate throughout, rarely entire, the alar region with few quadrate or rectangular cells, usually less than 30 with less than 10 in marginal row, and the large spores, 19–31 μm in longest dimension, are the best means of distinguishing this species from the others in the Maritimes.

Habitat: On tree trunks.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, Restigouche, Victoria); Nova Scotia (Annapolis, Colchester, Guysborough, Halifax, Inverness, Victoria); Prince Edward Island (Kings, Queens).

Range: *Newfoundland to *Manitoba, south to North Carolina and Ohio; also in Arizona. *Europe, *Asia.

Chromosome Number: Unreported.

Remarks: The three Maritime species of *Pylaisiella* are extremely troublesome to differentiate. Other authors (e.g., Grout, 1928–34) have used the peristome teeth to distinguish the three taxa. They state that the endostome segments are completely adherent to the exostome segments in *P. intricata*, the endostome is adherent to the exostome on the lower half only in *P. selwynii* and the endostome is entirely free and separate from the exostome in *P. polyantha*. However, I did not find the three types of peristome conditions to correlate with the gametophytic characters and therefore I have omitted them from the key.

3. Pylaisiella polyantha (Hedw.) Grout, Bull. Torrey Bot. Cl. 23: 229. 1896.

Leskea polyantha Hedw., Spec. Musc. 229. 1801.

[Synonyms: *Pylaisia polyantha* (Hedw.) B.S.G.; *P. jamesii* Sull. & Lesq.; *P. pseudo-platygyrium* Kindb. *ex* Mac. & Kindb.]

PLATE 343

The leaves, mainly straight and erect, with margins entire or serrulate only above, alar region with numerous quadrate or rectangular cells, usually about 50–60 with more than 10 in marginal row, and the small spores, 10–17 μm in longest dimension, will distinguish this species from the others in the genus. There is a tendency for the endostome to be entirely free and separate from the exostome in this species, whereas they are fused to some extent in the other species, but this cannot be relied upon.

Habitat: On tree trunks, occasionally on rotten stumps, and rocks.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Kent, Madawaska, Queen's, Restigouche, Victoria, Westmorland, York); Nova Scotia (Colchester, Digby, Inverness, Kings, Shelburne, Victoria, Yarmouth).

Range: Labrador to Alaska, south to Rhode Island, Michigan, Iowa, Nebraska, New Mexico, and Arizona. Europe, *Asia, *Africa.

Chromosome Number: $n = 11$.

Remarks: This species and the others often resemble *Platygyrium repens* but *Platygyrium* is dioicous and usually has the asexual brood branchlets in the axils of the upper branch leaves.

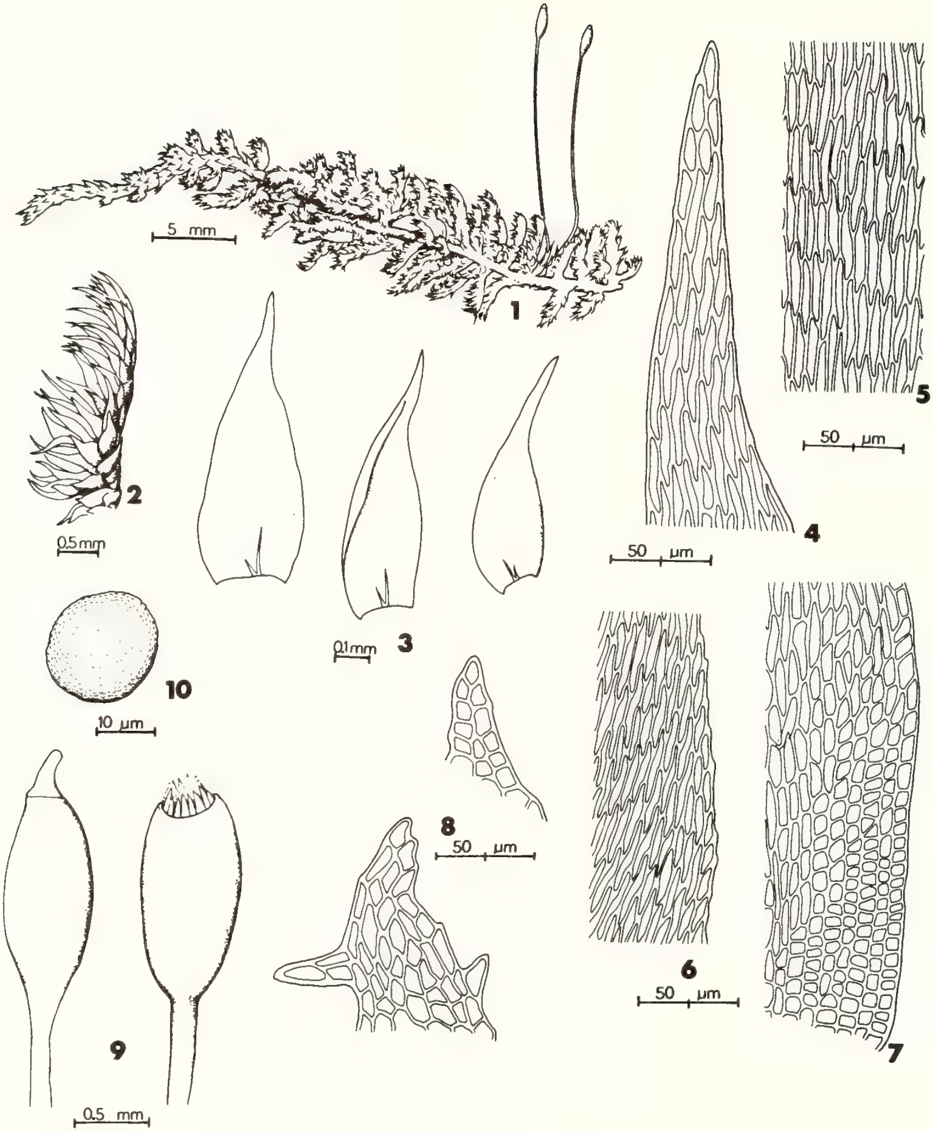
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Plate 341. *Pylaisiella selwynii*. 1. Habit. 2. Apical portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Capsules, operculate (wet), inoperculate (dry). 10. Spore.

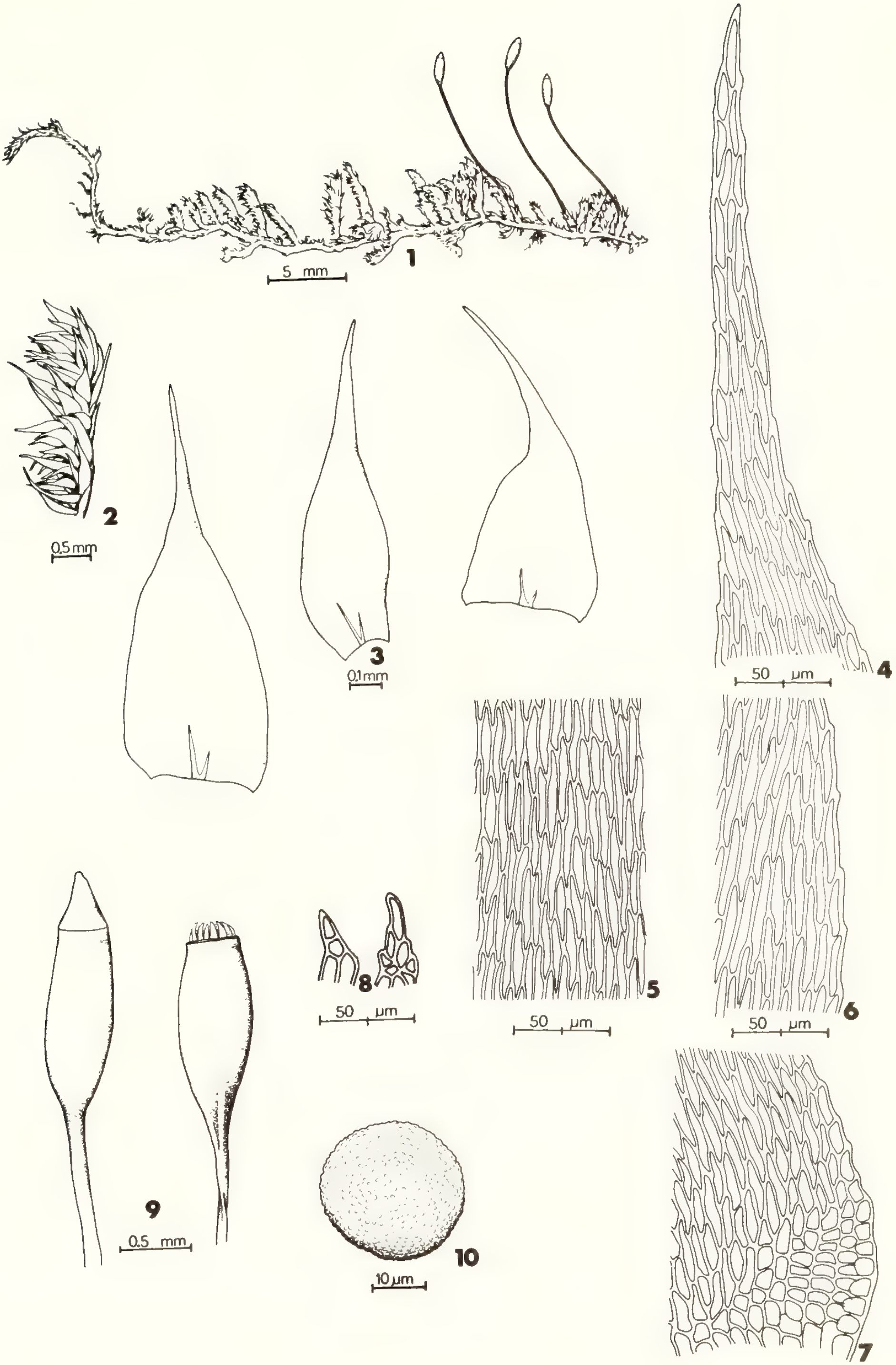
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Plate 342. *Pylaisiella intricata*. 1. Habit. 2. Apical portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Capsules, operculate (wet), inoperculate (dry). 10. Spore.

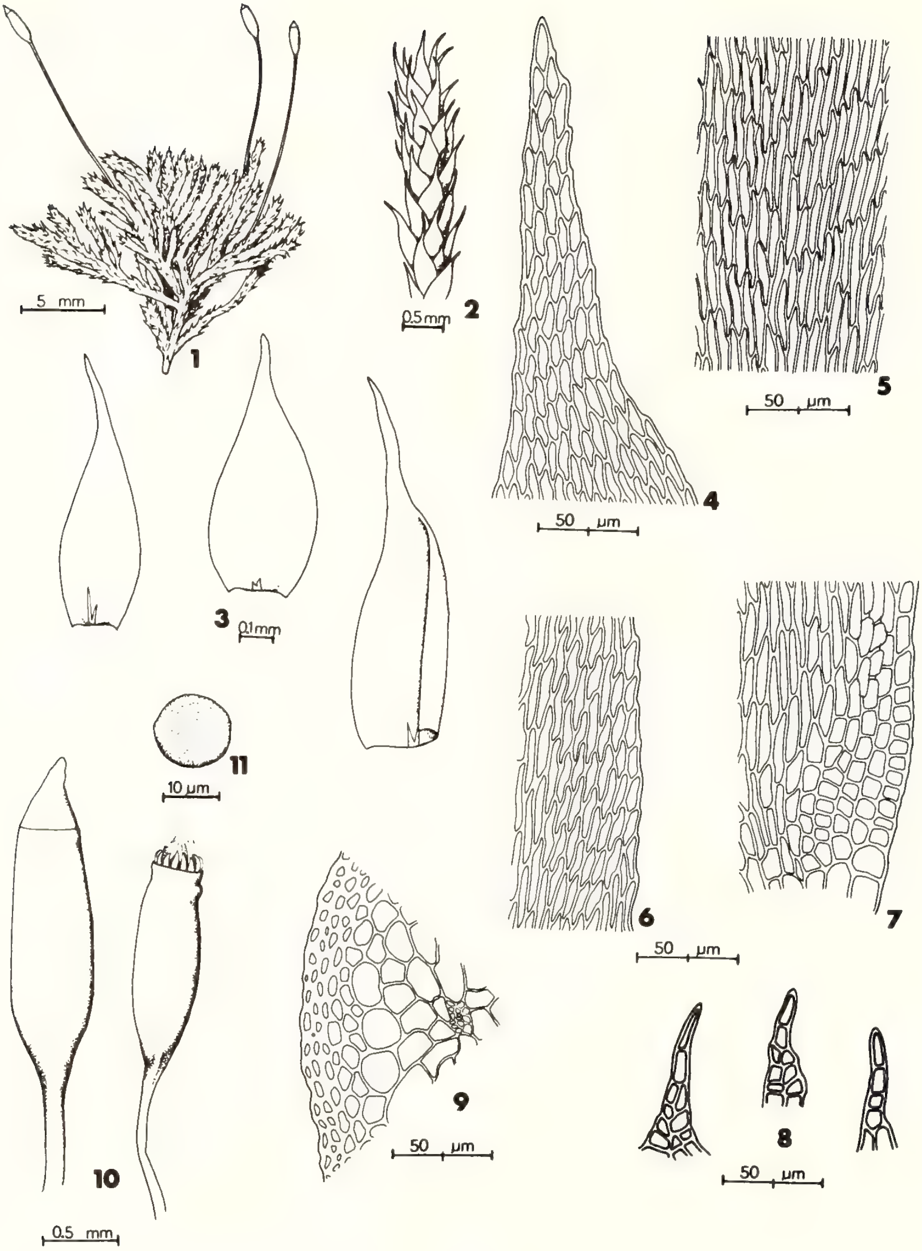
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Plate 343. *Pylaisiella polyantha*. 1. Habit. 2. Apical portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry). 11. Spore.

3. **Homomallium** (Schimp.) Loeske, Hedwigia 46: 314. 1907.
Hypnum subg. *Homomallium* Schimp., Syn. 616. 1860.

Habit: Prostrate, in dense, low mats.

Colour: Dark green, brownish green or yellowish, slightly glossy to dull.

Stems: 1–2 cm long, creeping, irregularly branched, epidermal cells small and thick-walled in cross-section, rhizoids sparse, papillose, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, broadly lanceolate.

Leaves: Stem and branch leaves similar except in size, close to somewhat distant, concave, smooth, erect to erect-spreading, often homomallous when dry, straight, ovate to oblong-ovate, abruptly acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, oblong, acuminate, erect, smooth.

Leaf Margins: Plane or recurved below to leaf middle, entire or serrulate from apex to near middle of leaf, entire below.

Costae: Double, extending $^1/_5$–$^1/_4$ the length of the leaf, sometimes lacking.

Leaf Cells: Smooth, the walls of medium thickness or thick, basal cells sometimes pitted. Median cells shortly oblong-rhomboidal, alar cells quadrate to rectangular, often transversely elongate on margins, numerous.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish.

Capsules: Solitary, on setae scattered along stems, yellow, yellowish- or reddish-brown, oblong to oblong-cylindric, arcuate, inclined to horizontal, smooth, contracted below mouth and somewhat wrinkled at neck when dry.

Setae: Flexuose, smooth, not or scarcely twisted when dry, yellow, orange or red.

Annuli: 1–2 rows of large cells, deciduous.

Opercula: High-conic to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow or orange, endostome hyaline, 1–2 cilia, sometimes rudimentary or lacking, nodose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–14 µm in longest dimension.

1. **Homomallium adnatum** (Hedw.) Broth., Nat. Pfl. 1(3): 1027. 1908.
Hypnum adnatum Hedw., Spec. Musc. 248. 1801.
[Synonym: *Amblystegium adnatum* (Hedw.) Aust.]
PLATE 344

Plants small, in dense, green, brownish green or yellowish mats, stems irregularly branched, up to 2 cm long, leaves 0.5–1.0 mm long, ovate to oblong-ovate, abruptly acuminate, smooth, often homomallous when dry, margins plane or recurved below to leaf middle, entire or serrulate from apex to leaf middle, leaf cells smooth, median shortly oblong-rhomboidal, alar quadrate to rectangular, often transversely elongate on margins, costae short and double; autoicous, setae flexuose, yellow, orange or red, 0.5–1.2 cm long, capsules oblong to oblong-cylindric, arcuate, inclined to horizontal, yellow, yellowish- or reddish-brown, 1.0–1.5 mm long.

Habitat: On boulders and bases of deciduous trees near streams and rivers.

Maritime Distribution: Rare. New Brunswick (Queen's, Westmorland); Nova Scotia (Kings).

Range: Nova Scotia to Ontario, south to North Carolina, Tennessee, Arkansas, and Texas; also in *British Columbia, *Saskatchewan, and Arizona. *Asia.

Chromosome Number: Unreported.

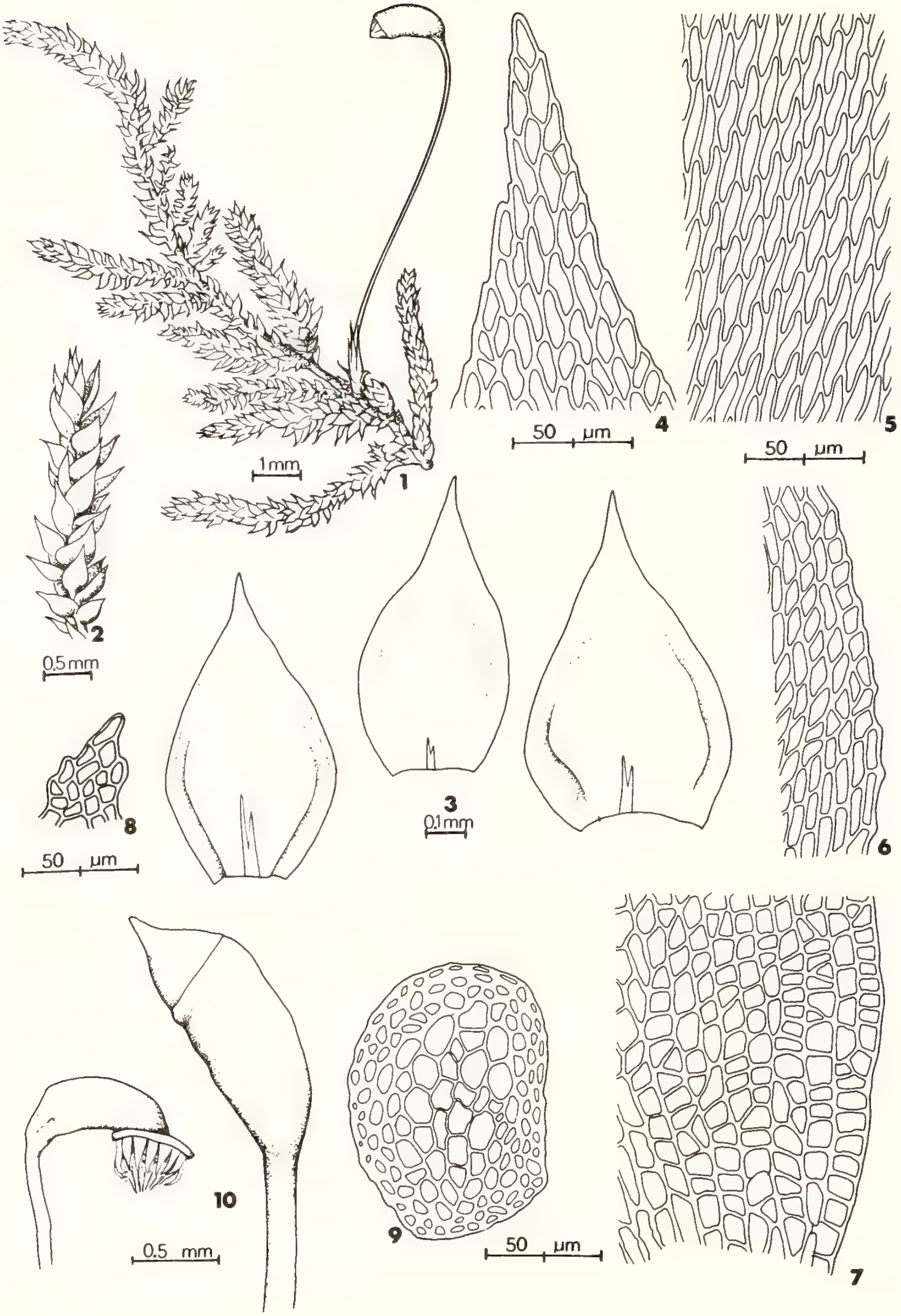
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Plate 344. *Homomallium adnatum*. 1. Habit. 2. Portion of branch. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllium. 9. Cross-section of stem. 10. Capsules, operculate (wet), inoperculate (dry).

4. **Callicladium** Crum, Bryologist 74(2): 167. 1971.

Habit: Prostrate, in loose mats.

Colour: Green, yellowish or brownish, somewhat glossy.

Stems: 3–8 cm long, creeping, irregularly to subpinnately branched, somewhat complanate-foliate, epidermal cells small and thick-walled in cross-section, rhizoids sparse, smooth, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, narrowly lanceolate, some nearly filamentous, rarely forked.

Leaves: Stem and branch leaves similar except in size, close, concave, smooth, erect to erect-spreading, straight to falcate, sometimes falcate-secund, especially near tips of stems and branches, scarcely changed when dry, lanceolate to ovate, acuminate, sometimes abruptly so, nondecurrent. Perichaetial leaves sheathing base of seta, ovate-lanceolate, long-acuminate, squarrose, smooth.

Leaf Margins: Plane, entire or often serrulate at apex.

Costae: Double, extending $^1/_6$–$^1/_3$ the length of the leaf, sometimes lacking.

Leaf Cells: Smooth, the walls of medium thickness or thick, basal cells pitted. Median cells fusiform or vermicular, alar cells enlarged and inflated, quadrate to rectangular, thick-walled, yellowish.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, yellowish with reddish tip.

Capsules: Solitary, on setae scattered along stems, reddish orange to reddish brown, cylindric, arcuate, suberect, smooth, contracted below mouth and sometimes urn weakly wrinkled when dry.

Setae: Flexuose, smooth, occasionally somewhat twisted when dry, orange to red.

Annuli: Lacking.

Opercula: High-conic to short-rostrate, straight to slightly arcuate.

Peristomes: Double, hypnaceous, exostome orange, endostome yellow to hyaline, 0–1 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–19 μm in longest dimension.

1. **Callicladium haldanianum** (Grev.) Crum, Bryologist 74(2): 167. 1971.
Hypnum haldanianum Grev., Ann. Lyc. Nat. Hist. New York 1: 275. 1825.
[Synonym: *Heterophyllium haldanianum* (Grev.) Kindb.]
PLATE 345

Plants medium-sized to large, in loose, green to yellowish brown mats, stems somewhat complanate-foliate, irregularly to subpinnately branched, up to 8 cm long, leaves 1–2 mm long, lanceolate to ovate, acuminate, smooth, margins plane, entire, often serrulate at apex, leaf cells smooth, median fusiform or vermicular, alar enlarged and inflated, quadrate to rectangular, thick-walled, yellowish, costae short and double; autoicous, setae flexuose, orange to red, 1.5–3.0 cm long, capsules cylindric, arcuate, suberect, reddish orange to reddish brown, 1.5–3.0 mm long.

Habitat: On rotten logs, stumps, bases of trees, rock and soil.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, King's, Madawaska, Queen's, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Antigonish, Colchester, Digby, Halifax, Hants, Inverness, Kings, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Newfoundland to Manitoba, south to North Carolina, Indiana, and Louisiana; also in British Columbia, Arizona, and California. Europe, Asia.

Chromosome Number: n = 11, 22.

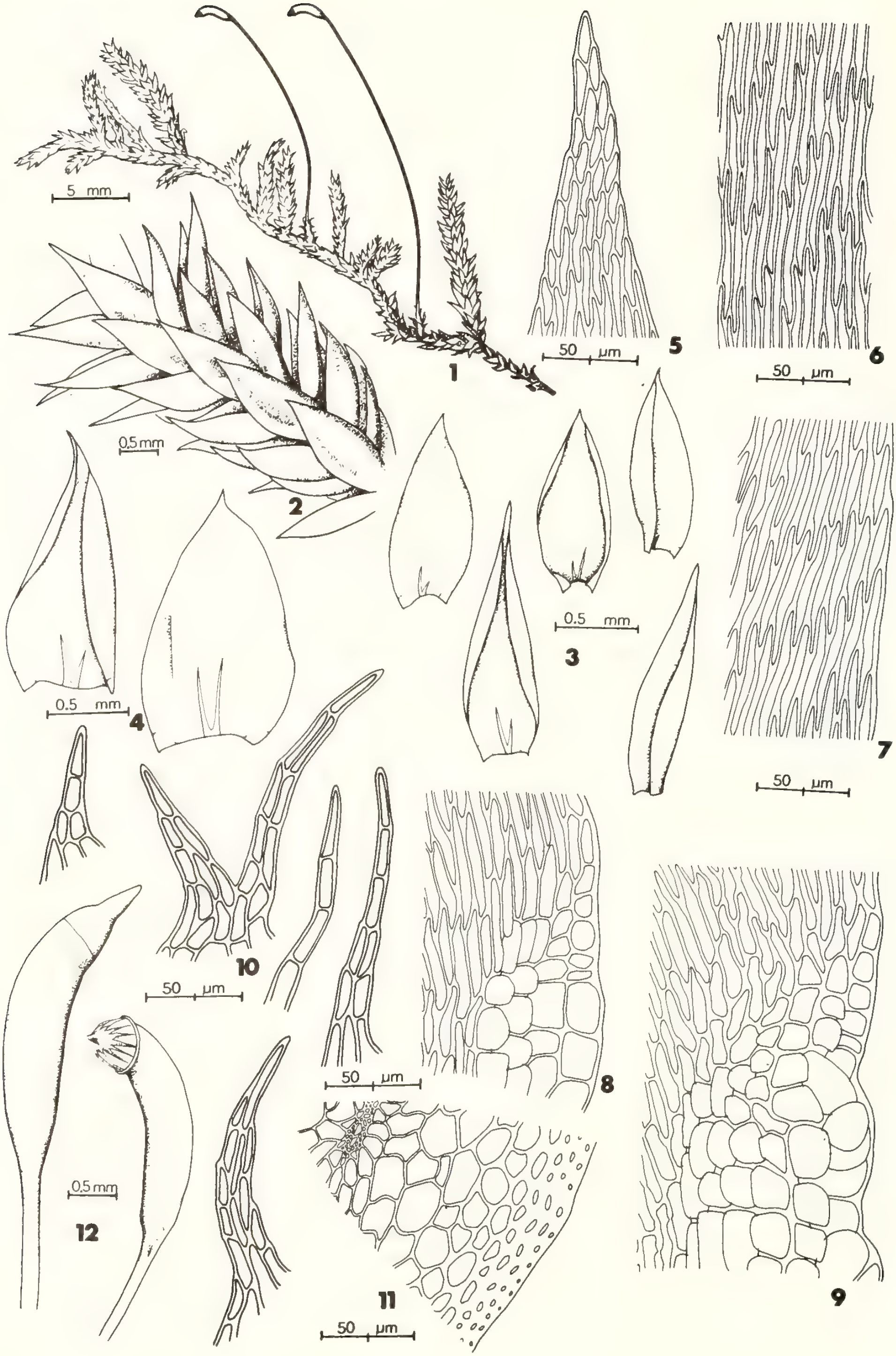
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Plate 345. *Callicladium haldanianum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–9. Leaf cells (5, apical of branch leaf. 6, median of stem leaf. 7, median-marginal of stem leaf. 8, alar of branch leaf. 9, alar of stem leaf.). 10. Pseudoparaphyllia. 11. Cross-section of portion of stem. 12. Capsules, operculate (wet), inoperculate (dry).

5. **Hypnum** Hedw., Spec. Musc. 236. 1801. *nom. cons.*
[Synonym: *Stereodon* (Brid.) Mitt.]

Habit: Prostrate to ascending, in loose to dense mats or tufts.

Colour: Green to yellowish- or brownish-green, often glossy.

Stems: 2–10 cm long, creeping to ascending, irregularly to pinnately branched, tips often arcuate, epidermal cells small and thick-walled or large and thin-walled in cross-section, rhizoids smooth, in clusters just below juncture of leaves on ventral surface of stems and branches. Pseudoparaphyllia usually present, foliose, lanceolate, sometimes deeply incised and ciliate, occasionally lacking. Paraphyllia rarely present (*H. recurvatum*), filamentous to narrowly foliose.

Leaves: Stem and branch leaves similar except in size, usually with a braided appearance, close, concave to nearly flat, smooth, secund or falcate-secund, unchanged when dry, ovate- or oblong-lanceolate, acute to acuminate, nondecurrent to shortly decurrent. Perichaetial leaves sheathing base of seta, ovate- or oblong-lanceolate, long-acuminate, often spreading at tips, smooth to plicate.

Leaf Margins: Plane, sometimes recurved below, entire to serrulate or serrate throughout.

Costae: Double, extending a short distance above base, sometimes lacking.

Leaf Cells: Smooth, the walls of medium thickness or thick, mostly pitted. Median cells fusiform, vermicular or rhomboidal, alar cells quadrate, rectangular or round, sometimes in several rows and with 8–12 on margins, rarely only a few present.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous or dioicous.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, ovoid, oblong-cylindric or cylindric, nearly straight to arcuate, erect to horizontal, smooth, striate or wrinkled, often contracted below mouth and wrinkled at neck when dry.

Setae: Straight or flexuose, smooth, twisted when dry, yellow, brown or reddish brown.

Annuli: 2–3 rows of cells, sometimes revoluble, deciduous, rarely persistent, rarely lacking.

Opercula: Conic to rostrate, straight to arcuate.

Peristomes: Double, perfect, 16 exostome teeth, lanceolate, cross-striolate below, papillose above, trabeculate at back, yellowish or yellowish-brown, endostome segments 16, keeled, minutely papillose, arising from basal membrane, hyaline, cilia 1–3, nodose or nodulose, alternating with segments, sometimes rudimentary.

Spores: Green, greenish- or yellowish-brown, globose to ovoid, smooth to papillose, 10–26 μm in longest dimension.

Ando (1972, 1973, 1976) is studying the genus *Hypnum* on a worldwide basis.

1. Epidermal cells of stems enlarged, thin-walled 2
    2. Plants with numerous branches, usually regularly pinnate; leaves filiform-acuminate .... 5. *H. fertile*
    2. Plants with few branches, never pinnate; leaves acute to broadly acuminate 3
        3. Alar cells abruptly enlarged and inflated; pseudoparaphyllia lacking .... 7. *H. lindbergii*
        3. Alar cells gradually enlarged; pseudoparaphyllia foliose, broadly lanceolate .... 8. *H. pratense*
1. Epidermal cells of stems small, thick-walled 4
    4. Alar regions distinct, composed of numerous, small, quadrate, short-rectangular, or round cells, usually about 8–12 on the margins and extending several rows inward 5
        5. Leaf margins serrulate to serrate throughout; pseudoparaphyllia broadly lanceolate, usually ending in one cell; autoicous .... 2. *H. pallescens*
        5. Leaf margins entire or serrulate above, entire below; pseudoparaphyllia deeply incised and ciliate or narrowly lanceolate, ending in a row of 3–6 cells; autoicous or dioicous 6

6. Autoicous, often with sporophytes; pseudoparaphyllia deeply incised and ciliate .... 4. *H. imponens* (in part)

6. Dioicous, seldom with sporophytes; pseudoparaphyllia filamentous to narrowly lanceolate, not incised 7

7. Plants with broad stems and branches, often 0.7–1.5 mm wide; leaves usually secund .... 3. *H. cupressiforme*

7. Plants with slender stems and branches, seldom over 0.5 mm wide; leaves erect-spreading, only slightly secund .... 3a. *H. cupressiforme* var. *filiforme*

4. Alar regions indistinct, composed of only a few differentiated cells that are sometimes abruptly enlarged and inflated 8

8. Plants large, stems and branches often 1 mm wide or more; pseudoparaphyllia present, incised and ciliate, or lacking 9

9. Alar regions with few differentiated cells, usually only 1–3 in marginal rows; pseudoparaphyllia lacking or when rarely present not incised and ciliate; capsules broad, horizontal, wrinkled when dry ...... 6. *H. curvifolium*

9. Alar regions with several differentiated cells, usually more than 3 in marginal rows; pseudoparaphyllia present, incised and ciliate; capsules suberect, slender, smooth .... 4. *H. imponens* (in part)

8. Plants small to medium-sized, stems and branches mostly less than 1 mm wide; pseudoparaphyllia or paraphyllia present, never incised and ciliate 10

10. Pseudoparaphyllia present; capsules straight or nearly so; occurring on wood, usually bases of trees, rarely on acidic rock .... 2a. *H. pallescens* var. *protuberans*

10. Paraphyllia present; capsules arcuate; occurring on calcareous rock .... 1. *H. recurvatum*

1. **Hypnum recurvatum** (Lindb. & H. Arnell) Kindb., Enum. Bryin. Exot. 100. 1891.
Stereodon recurvatus Lindb. & H. Arnell, K. Svenske Vet. Ak. Handl. 23(10): 149. 1890.
[Synonyms: *H. bridelianum* Crum, Steere & Anders.; *H. fastigiatum* Brid.]
PLATE 346

Plants small, in thin to dense, green, yellowish- or brownish-green mats, stems pinnately branched, up to 4 cm long, epidermal cells small and thick-walled in cross-section, paraphyllia filamentous to narrowly foliose, leaves 0.6–1.0 mm long, ovate, ovate- or oblong-lanceolate, acuminate, margins plane or recurved below, entire or serrulate throughout, leaf cells smooth, median fusiform or vermicular, alar quadrate or rectangular, few, 4–8 on margins; autoicous, setae 0.8–1.5 cm long, capsules cylindric, arcuate, inclined to horizontal, smooth, 1–2 mm long, spores 12–17 μm.

Habitat: On moist calcareous boulders and cliff ledges.

Maritime Distribution: Rare. New Brunswick (Victoria). Collected at Grand Falls, 47°03′N, 67°44′W, 22 June 1945 (*Habeeb 70 Musci Novi Brunsvici*) and 7 August 1968 (*Ireland 12633*).

Range: Labrador to Alaska. Europe, *Asia.

Chromosome Number: Unreported.

2. **Hypnum pallescens** (Hedw.) P. Beauv., Prodr. 67. 1805.
Leskea pallescens Hedw., Spec. Musc. 219. 1801.
[Synonym: *H. reptile* Michx.]
PLATE 347

Plants small, in dense, dark green to yellowish green mats, stems pinnately branched, up to 4 cm long, epidermal cells small and thick-walled in cross-section, pseudoparaphyllia foliose, lanceolate, leaves 0.5–1.0 mm long, ovate- or oblong-lanceolate, acuminate, sometimes abruptly so, margins recurved below, serrulate to serrate, leaf cells smooth, median fusiform, vermicular or rhomboidal, alar quadrate, rectangular or round, 8–12 on margins, extending several rows inward; autoicous, setae 0.7–1.5 cm long, capsules cylindric, arcuate, mouth oblique, erect to inclined, smooth, somewhat wrinkled at neck when dry, 1.5–2.5 mm long, spores 10–17 μm.

Habitat: On bases of trees, decaying wood, especially logs and stumps, and boulders in woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Richmond, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: *Labrador to *Alaska and British Columbia, south to North Carolina, Tennessee, Michigan, Wisconsin, Minnesota, and Montana; also in Louisiana and Arizona. Europe, Asia, *Africa.

Chromosome Number: n = 11.

2a. Hypnum pallescens var. **protuberans** (Brid.) Aust., Bot. Gaz. 1: 31. 1876.

Hypnum protuberans Brid., Bryol. Univ. 2: 612. 1827.

[Synonym: *H. depressulum* C. Müll.]

PLATE 348

Differing from var. *pallescens* by the erect-spreading to nearly squarrose leaves, giving the stems a less braided appearance, the few quadrate to rectangular alar cells, 4–8 on margins, the shorter, nearly straight and erect capsules, 1–2 mm long, and the larger spores, 12–22 μm. The plants are usually corticolous, rarely saxicolous, in the var. *protuberans*, whereas the var. *pallescens* frequently occurs on both substrates.

Habitat: On trees and rotten logs, rarely on rock.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Restigouche, Saint John, York); Nova Scotia (Annapolis, Cumberland, Digby, Halifax, Inverness, Kings, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Newfoundland to Ontario, disjunct in *Alberta and *British Columbia. *Europe, *Asia.

Chromosome Number: Unreported.

Remarks: This variety, which superficially resembles a *Pylaisiella* more than a *Hypnum* because of its phyllotaxy and erect capsules, needs a more detailed study to determine its taxonomic status. Ando (1973) places it in synonymy with *H. pallescens*.

3. Hypnum cupressiforme Hedw., Spec. Musc. 291. 1801.

PLATE 349

Plants medium-sized to large, in thin to dense, green, yellowish green or yellowish brown mats, stems pinnately to irregularly branched, up to 7 cm long, epidermal cells small and thick-walled in cross-section, pseudoparaphyllia filamentous to narrowly foliose, leaves 1–2 mm long, concave, ovate, ovate- or oblong-lanceolate, acuminate, sometimes abruptly so, margins plane, entire or serrulate above, leaf cells smooth, median fusiform or vermicular, alar quadrate, rectangular or round, numerous, 8–12 on margins and extending several rows inward; dioicous, setae 1.0–2.5 cm long, capsules cylindric, slightly arcuate, erect to inclined, smooth, 1.5–2.0 mm long, spores 14–20 μm.

Habitat: On calcareous boulders and cliffs, bases of trees, often in dry exposed places.

Maritime Distribution: Common. Nova Scotia (Annapolis, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Richmond, Shelburne, Victoria, Yarmouth, Sable Island); Prince Edward Island (Kings).

Range: Labrador to *Alaska, south to *North Carolina, Wisconsin, Minnesota, *Nebraska, Colorado, and *Arizona. Cosmopolitan.

Chromosome Number: n = 10, 11, 16.

Remarks: *Hypnum vaucheri* Lesq., another calciphile sometimes mistaken for *H. cupressiforme*, has been reported for Nova Scotia (see Excluded Taxa) although I have been unable to verify the specimen. The species occurs nearby in Quebec, Labrador and Newfoundland so that its presence in the Maritime Provinces is to be expected. It can readily be distinguished from *H. cupressiforme* by the plants smaller size, the shorter median leaf cells, the more numerous quadrate to rounded alar cells and the pseudoparaphyllia which are short and broadly lanceolate.

3a. Hypnum cupressiforme var. **filiforme** Brid., Musc. Rec. 2(2): 138. 1801.

PLATE 350

Close to the var. *cupressiforme* from which it differs by the long-filiform stems, seldom over 0.5 mm wide, that are irregularly branched and bear erect-spreading or only slightly secund leaves.

Habitat: On boulders, rock bluffs, trees and rotten logs in woods.

Maritime Distribution: Common. New Brunswick (Charlotte, Queen's); Nova Scotia (Annapolis, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Apparently rarer than the var. *cupressiforme*, known outside the Maritime Provinces only from Labrador and Newfoundland. Europe, *Asia, *Africa, *Australia, New Zealand.

Chromosome Number: Unreported.

Remarks: Although I consider this a weak variety of a variable species, some bryologists, such as

Smith (1978), consider it a distinct species, *H. mammillatum* (Brid.) Loeske.

4. **Hypnum imponens** Hedw., Spec. Musc. 290. 1801.

PLATE 351

Plants large, in thin to dense, yellowish green to yellowish brown mats, stems pinnately branched, up to 10 cm long, reddish, epidermal cells small and thick-walled in cross-section, pseudoparaphyllia foliose, deeply incised and ciliate, leaves 1.5–2.5 mm long, ovate- or oblong-lanceolate, slenderly acuminate, margins recurved at base, serrulate to serrate above, leaf cells smooth, median fusiform or vermicular, alar enlarged, quadrate, rectangular or oblong, orange to red, forming a conspicuous area; dioicous, setae 1–3 cm long, capsules cylindric, arcuate, mouth oblique, erect, smooth, 2–3 mm long, spores 14–22 μm.

Habitat: Predominatly on rotten logs and stumps in woods, sometimes on soil and soil over boulders.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, King's, Queen's, Saint John, Victoria, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Queens).

Range: Occurring in eastern North America, Labrador to Ontario, south to *Georgia, *Alabama, and *Arkansas; doubtfully in *British Columbia, *Yukon Territory, and *Alaska. Europe,, *Asia, *Africa.

Chromosome Number: n = 7, 11.

5. **Hypnum fertile** Sendtn., Denkschr. Bayer. Bot. Ges. Regensburg 3: 147. 1841.

PLATE 352

Plants small to medium-sized, in thin to dense, yellowish-green to yellowish-brown mats, stems pinnately branched, up to 4 cm long, epidermal cells large and thin-walled in cross-section, pseudoparaphyllia foliose, lanceolate, rarely incised and ciliate, leaves 1–2 mm long, ovate- or oblong-lanceolate, filiform-acuminate, margins plane, serrulate to serrate, leaf cells smooth, median fusiform or vermicular, alar rectangular to quadrate, region indistinct; autoicous, setae 1.5–2.5 cm long, capsules oblong-cylindric, arcuate, horizontal, striate or wrinkled when dry, 2.0–2.5 mm long, spores 10–14 μm.

Habitat: On humus, rotten logs, bases of trees and rocks in woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Queen's, Saint John); Nova Scotia (Annapolis, Colchester, Cumberland, Halifax, Hants, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: In eastern North America, from Labrador to Manitoba, south to North Carolina, Tennessee, and Wisconsin; doubtfully, in *British Columbia. Europe, *Asia.

Chromosome Number: n = 11.

6. **Hypnum curvifolium** Hedw., Spec. Musc. 285. 1801.

PLATE 353

Plants large, in thin to dense, green, yellowish green or brownish green mats, stems pinnately branched, up to 10 cm long, epidermal cells small and thick-walled in cross-section, pseudoparaphyllia lacking, leaves 1.5–2.5 mm long, ovate- or oblong-lanceolate, acuminate, margins plane, entire to serrulate throughout, leaf cells smooth, median fusiform or vermicular, alar enlarged, quadrate, rectangular or round, yellow or orange, forming a small group; dioicous, setae 2–3 cm long, capsules broadly oblong-cylindric, arcuate, horizontal, wrinkled when dry, 2.5–3.5 mm long, spores 17–24 μm.

Habitat: On wet soil over rocks, bases of trees, rotten logs near rivers and lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Victoria); Nova Scotia (Annapolis, Colchester, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria).

Range: In eastern North America, from Newfoundland to Ontario, south to South Carolina, Alabama, Mississippi, and Louisiana; doubtfully in *Alberta and *British Columbia. *Europe (?), *Asia (?).

Chromosome Number: n = 11.

7. **Hypnum lindbergii** Mitt., J. Bot. 2: 123. 1864. [Synonyms: *H. arcuatum* Lindb.; *H. patientiae* Lindb. *ex* Milde; *H. patientiae* var. *elatum* (Schimp.) Jaeg. & Sauerb.]

PLATE 354

Plants large, in thin, light-green to yellowish- or brownish-green tufts or mats, stems irregularly branched, up to 5 cm long, epidermal cells large and thin-walled in cross-section, pseudoparaphyllia lacking, leaves 1.5–3.0 mm long, ovate- or oblong-

lanceolate, acute to acuminate, margins plane, entire or sometimes serrulate above, leaf cells smooth, median fusiform or vermicular, alar abruptly enlarged and inflated, hyaline, thin-walled, delimited by region of quadrate to rectangular cells above; dioicous, Maritime plants unknown with sporophytes, reported to have setae 2.5–3.5 cm long, capsules oblong-cylindric, arcuate, inclined to horizontal, wrinkled when dry, 2.0–2.5 mm long, spores 13–22 μm.

Habitat: On humus, rocks, wet soil in roadside ditches, meadows, beside lakes and in swampy places.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, King's, Madawaska, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Richmond, Shelburne, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to Florida, Alabama, Mississippi, Louisiana, Texas, Colorado, Idaho, and Washington. Europe, Asia.

Chromosome Number: n = 6, 10, 11.

Remarks: This common species is very similar to the rarer *H. pratense* but differs by the noncomplanate plants, the alar cells that are abruptly enlarged and inflated and the lack of pseudoparaphyllia.

Capsules drawn from Vermont plants.

8. **Hypnum pratense** Koch *ex* Spruce, London J. Bot. 4: 177. 1845.

PLATE 355

Plants large, in thin, yellowish- or brownish-green mats, stems irregularly branched, somewhat complanate-foliate, up to 4 cm long, epidermal cells large and thin-walled in cross-section, pseudoparaphyllia foliose, lanceolate, sometimes lacking, leaves 1.5–3.0 mm long, ovate-lanceolate or oblong-ovate, acute to acuminate, margins plane, entire or often serrulate above, leaf cells smooth, median fusiform or vermicular, alar gradually enlarged, rectangular to oblong, not delimited by cells above; dioicous, setae 2–3 mm long, capsules oblong-cylindric, arcuate, inclined to horizontal, smooth, wrinkled at neck when dry, 1.5–2.0 mm long, spores 10–15 μm.

Habitat: In wet depressions and on humus hummocks in swampy, calcareous woods.

Maritime Distribution: Rare. New Brunswick (Carleton). Known from one locality, 1.6 km east of Stickney, ca 46°23′N, 67°34′W, *Ireland 12907, 12914, 12930.*

Range: Greenland to Alaska, south to Virginia, Indiana, Illinois, Montana, and Oregon; also in *Colorado. West Indies, Europe, *Asia.

Chromosome Number: n = 10.

Remarks: See *H. lindbergii.*

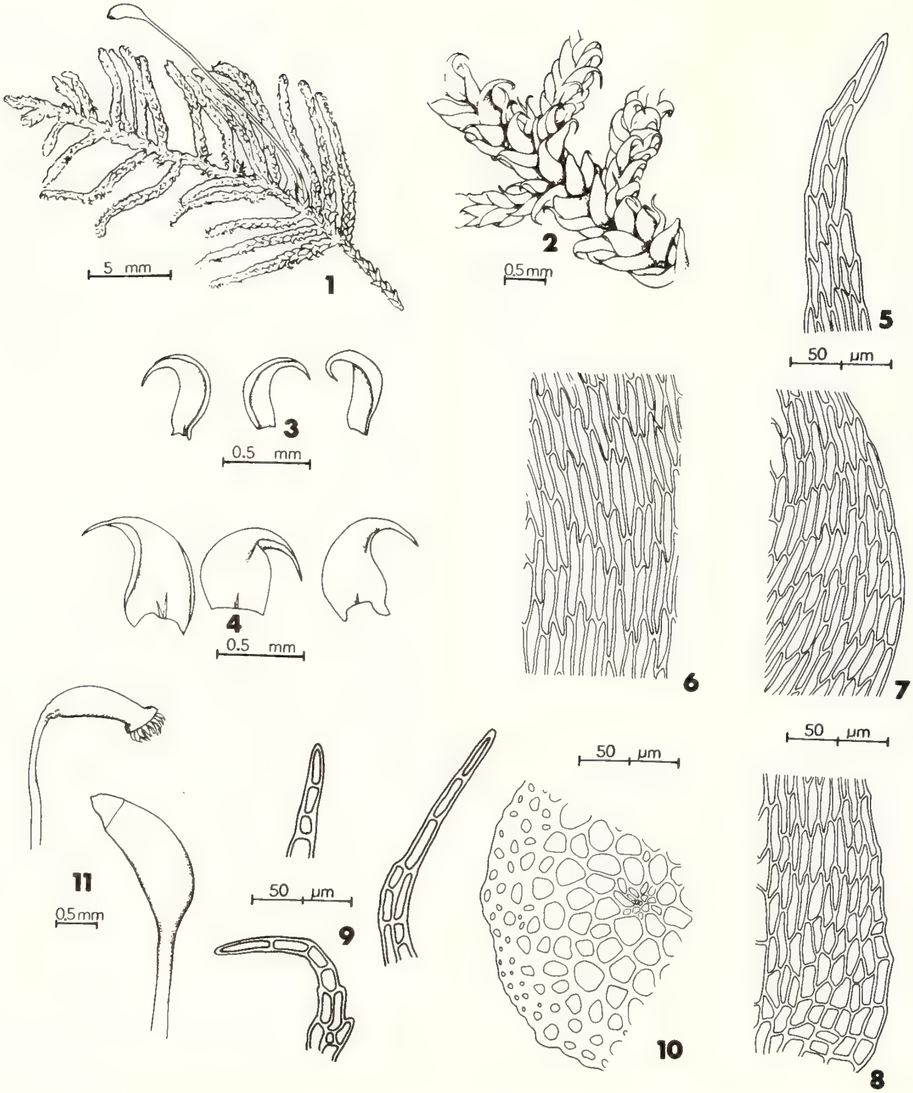
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Plate 346. *Hypnum recurvatum*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

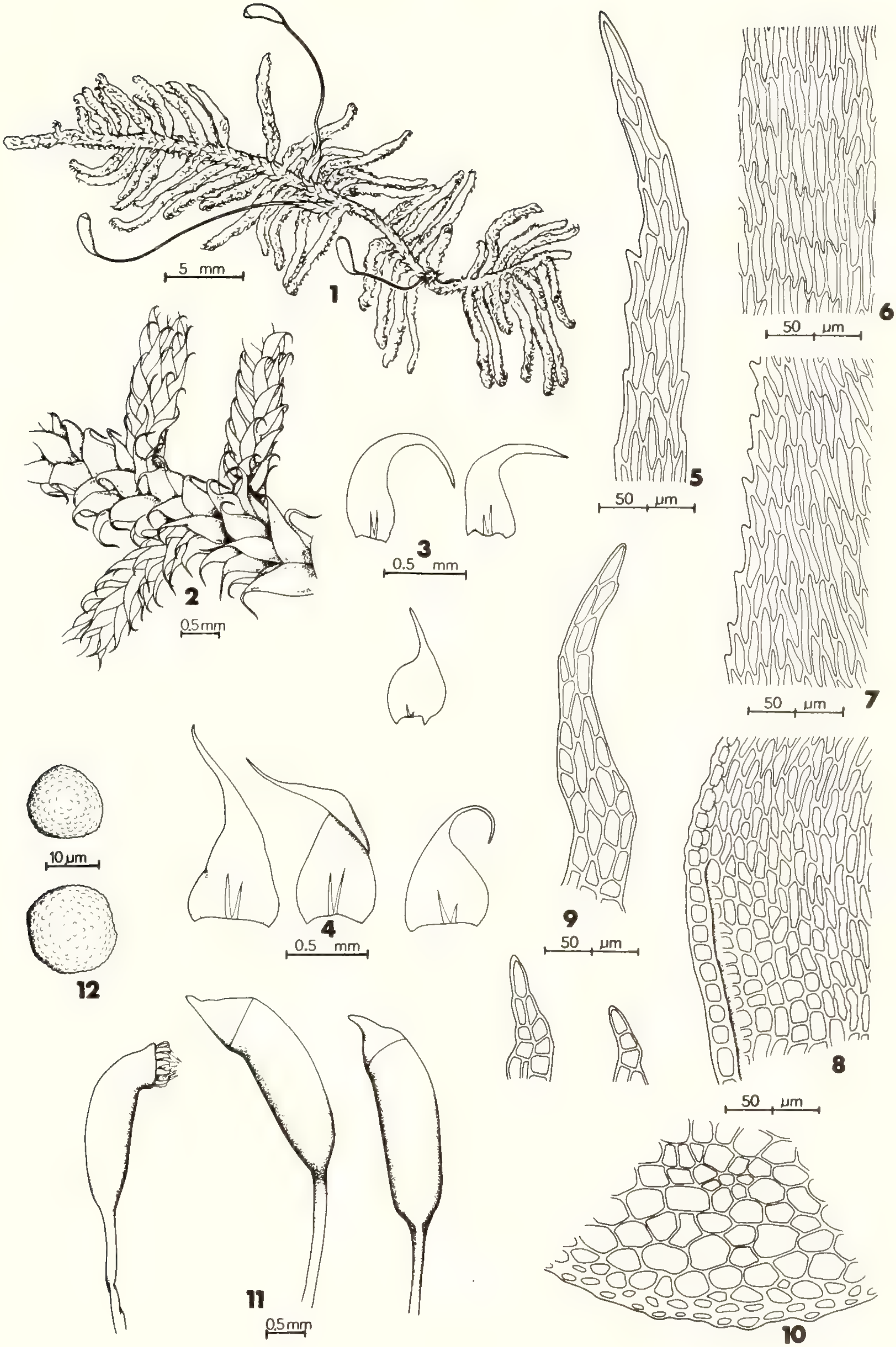
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Plate 347. *Hypnum pallescens*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllia. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry). 12. Spores.

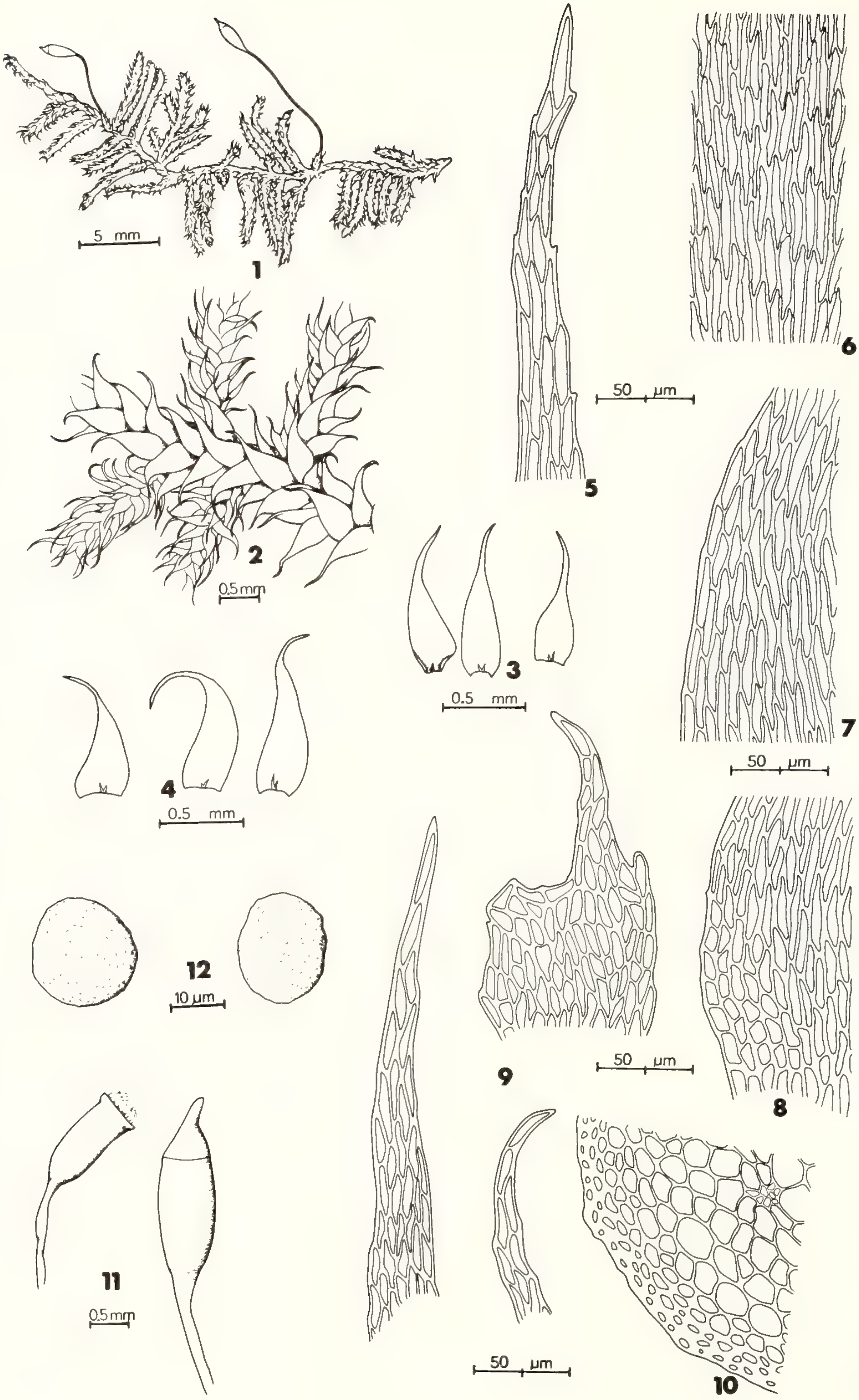
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Plate 348. *Hypnum pallescens* var. *protuberans*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllia. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry). 12. Spores.

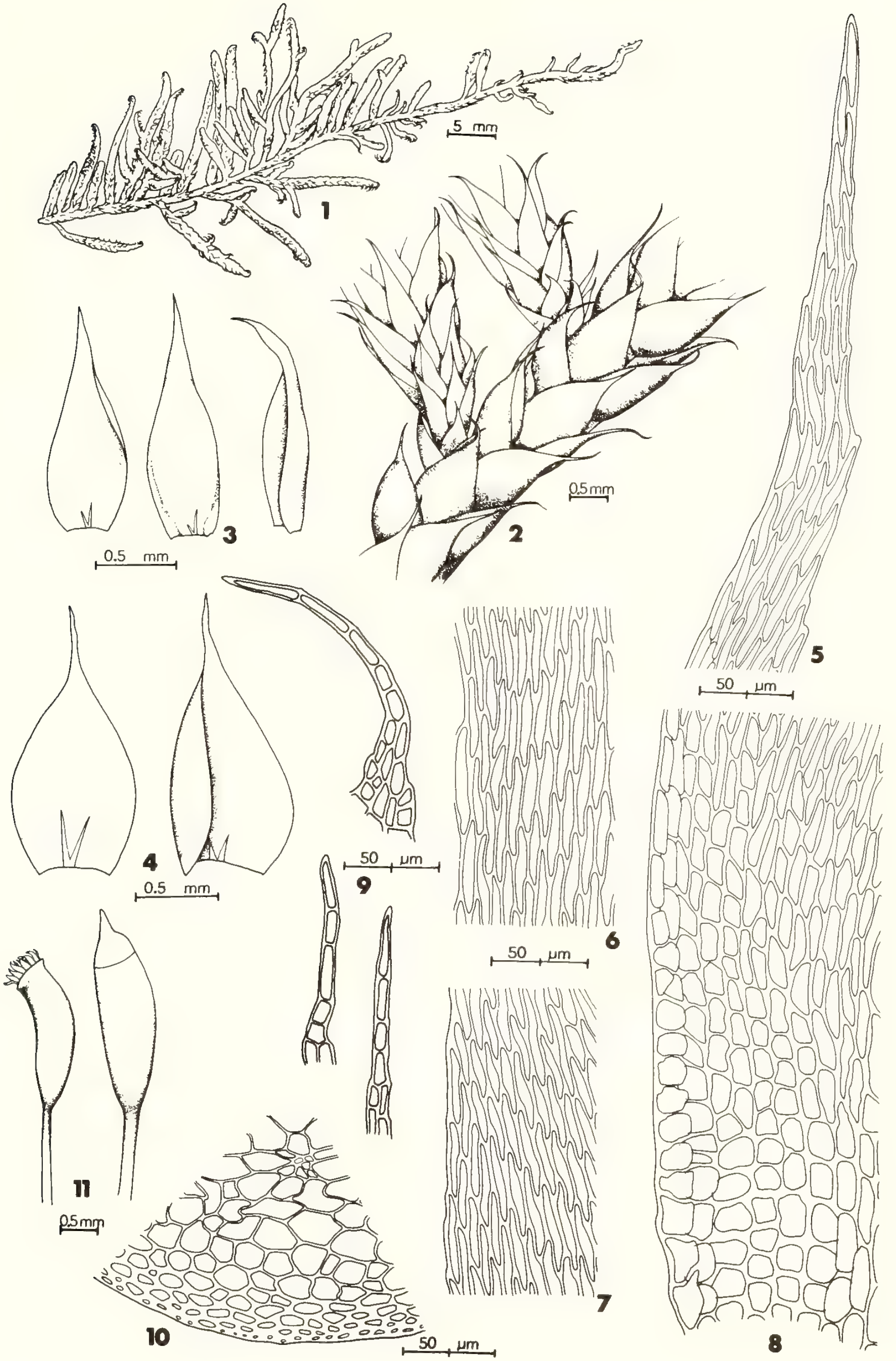
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Plate 349. *Hypnum cupressiforme*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllia. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

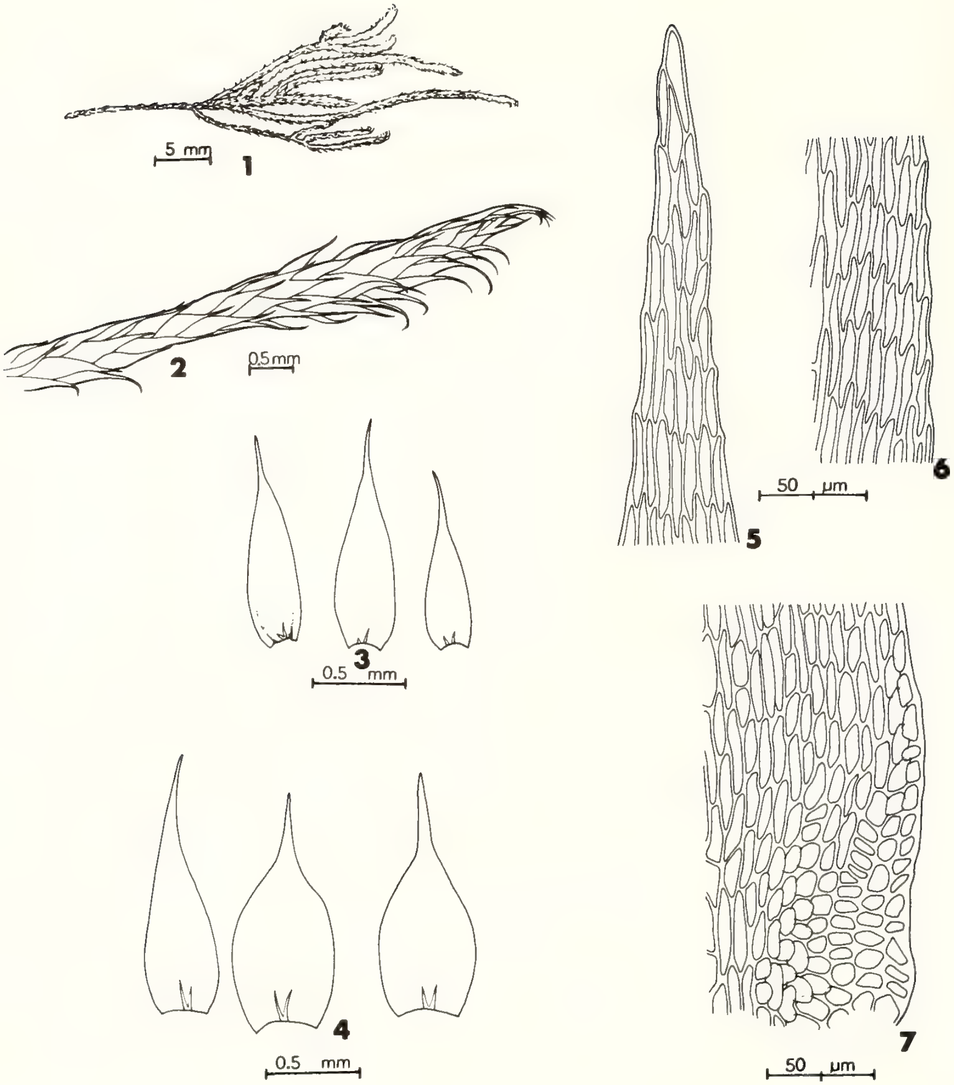
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Plate 350. *Hypnum cupressiforme* var. *filiforme*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–7. Leaf cells (5, apical. 6, median-marginal. 7, alar.).

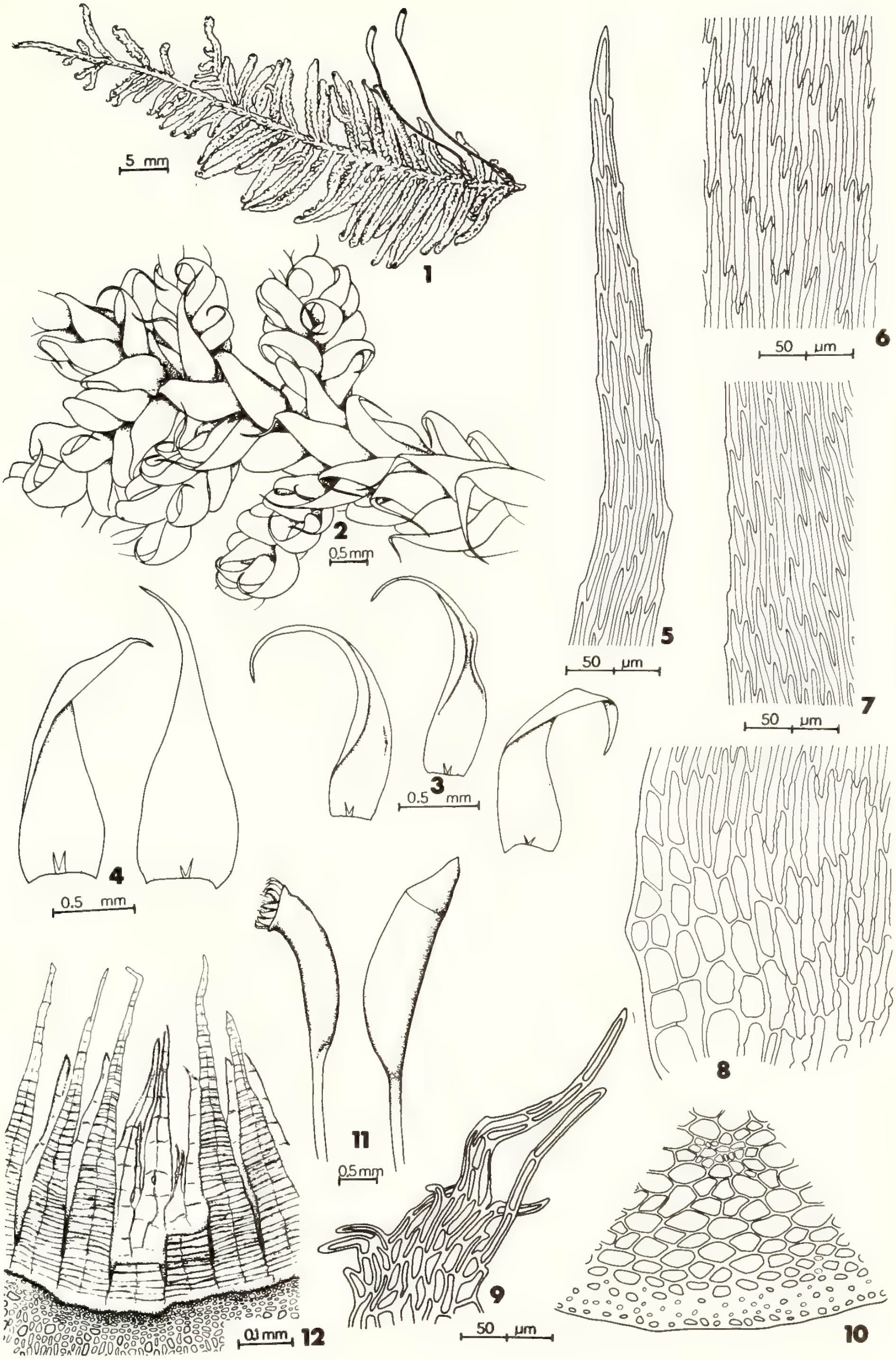
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Plate 351. *Hypnum imponens*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8,alar.). 9. Pseudoparaphyllium. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry). 12. Peristome teeth.

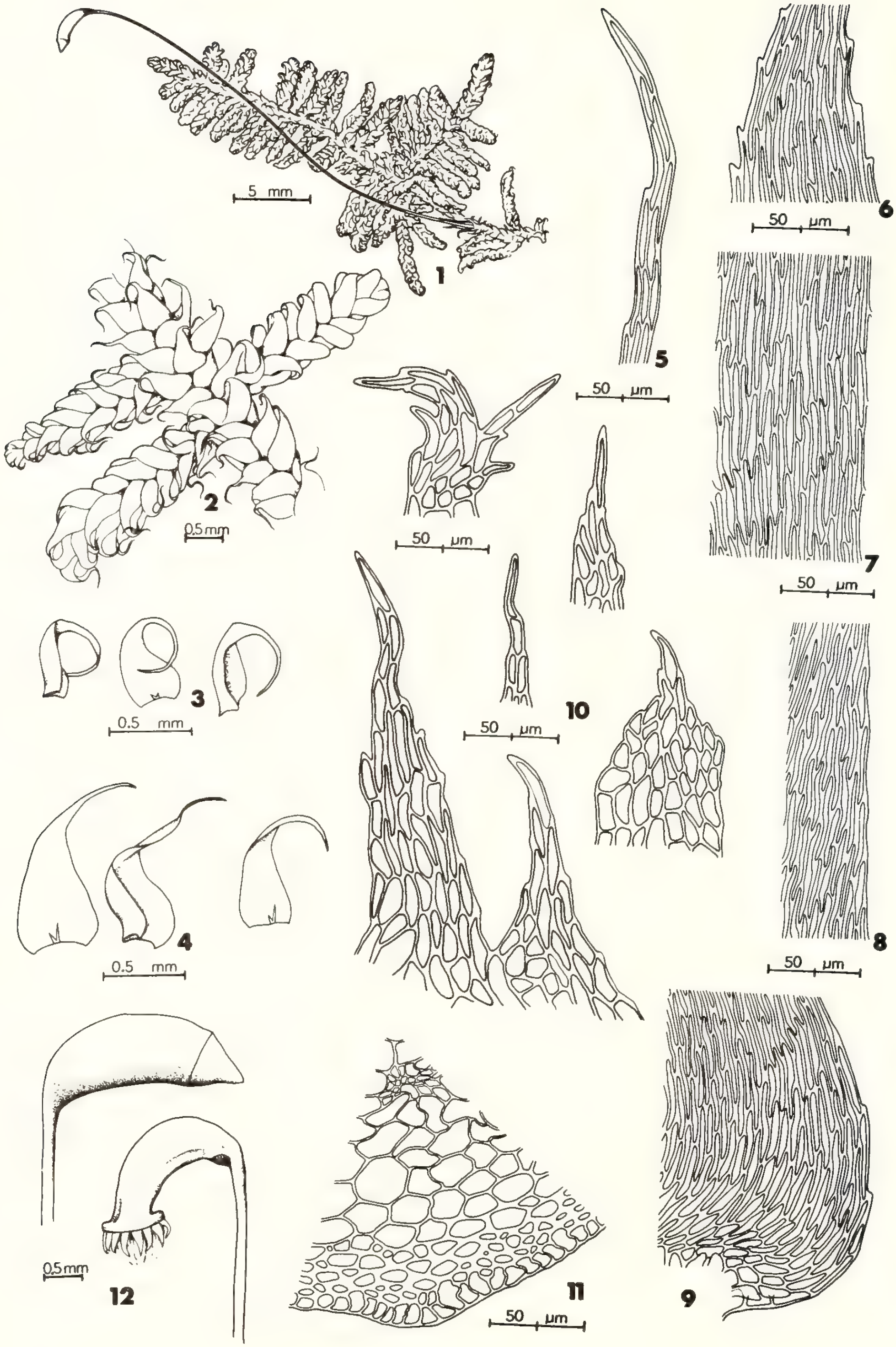
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Plate 352. *Hypnum fertile*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–9. Leaf cells (5, apical. 6, upper cells. 7, median. 8, median-marginal. 9, alar.). 10. Pseudoparaphyllia. 11. Cross-section of portion of stem. 12. Capsules, operculate (wet), inoperculate (dry).

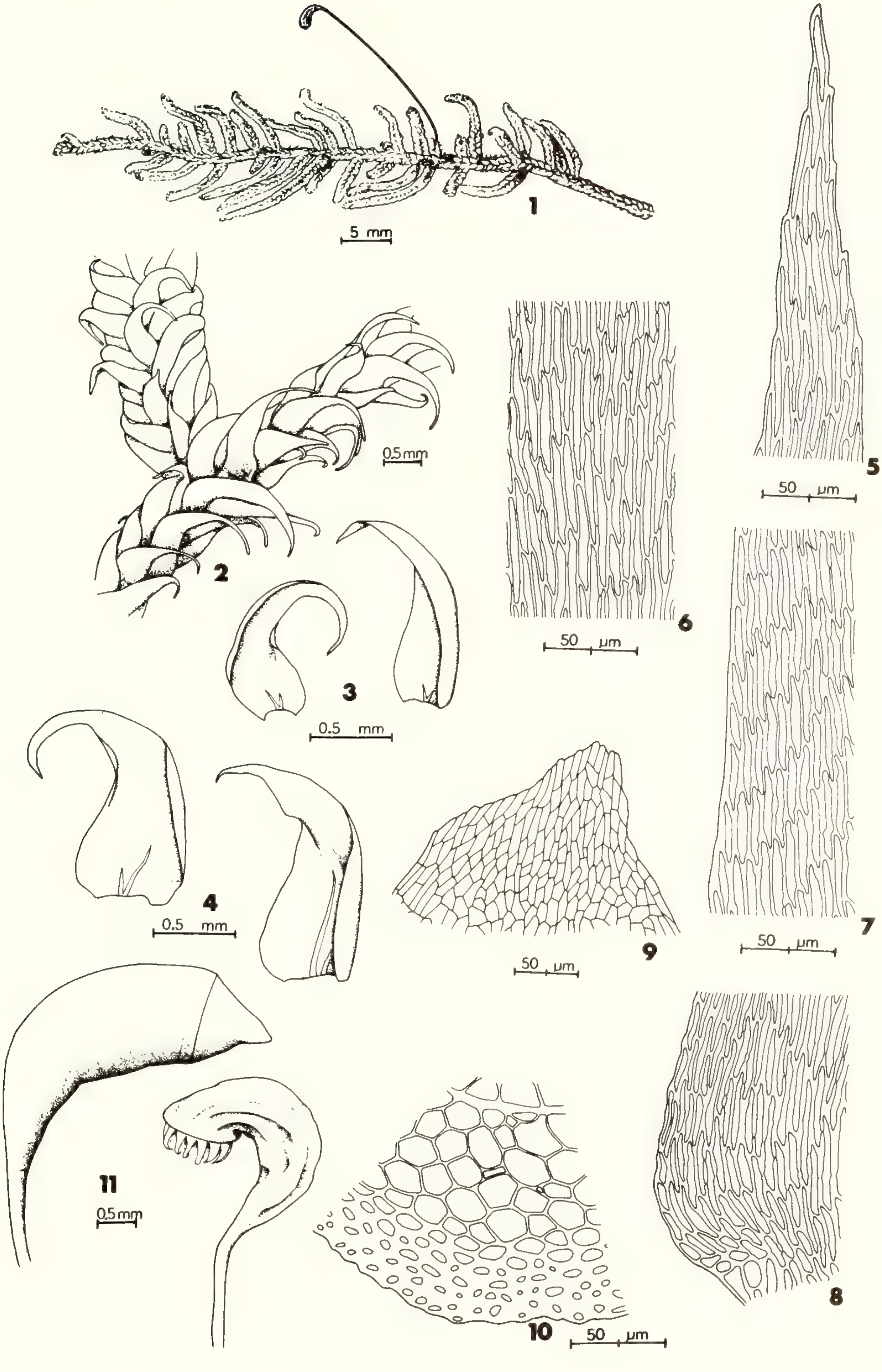
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Plate 353. *Hypnum curvifolium*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllium. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

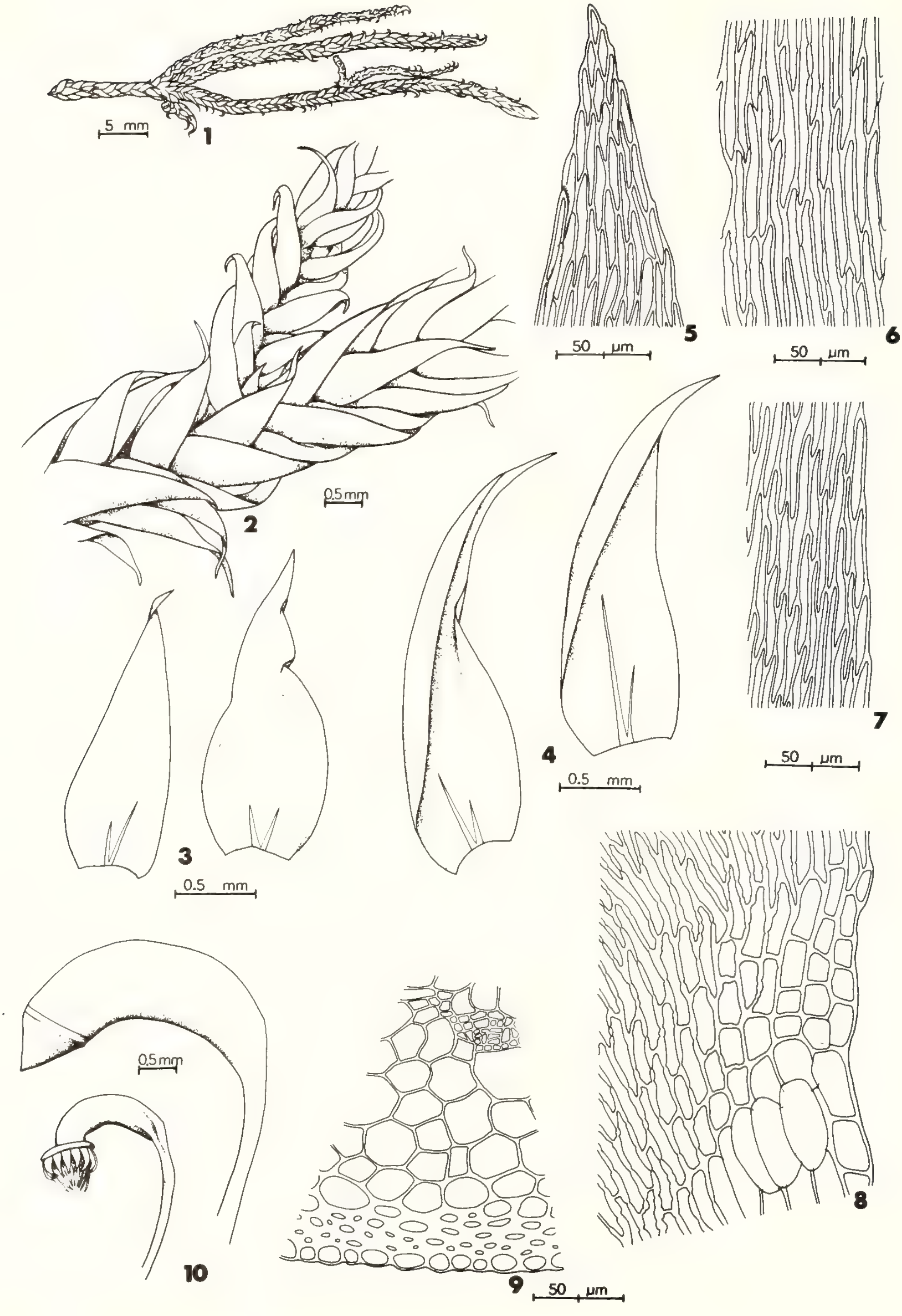
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Plate 354. *Hypnum lindbergii*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

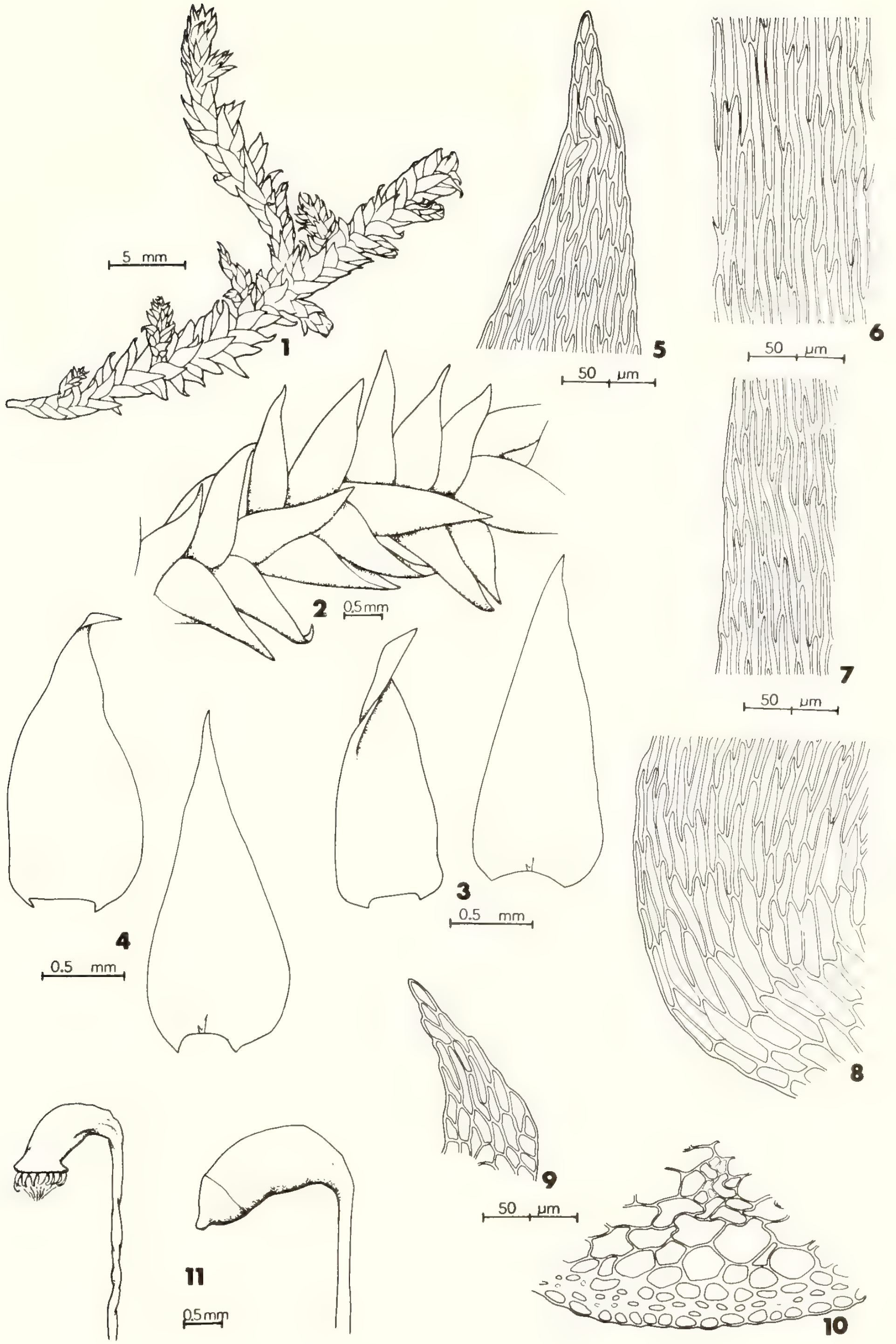
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Plate 355. *Hypnum pratense*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllium. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

6. **Isopterygium** Mitt., J. Linn. Soc. Bot. 12: 21. 1869.
[Synonym: *Isopterygiopsis* Iwats.]

Habit: Prostrate, in thin to dense mats.

Colour: Dark green to yellowish green, glossy.

Stems: 1–3 cm long, creeping, simple or sparingly and irregularly branched, usually complanate-foliate, epidermal cells small and thick-walled or large and thin-walled (*I. muellerianum*) in cross-section, rhizoids smooth or papillose, in clusters in leaf axils (*I. muellerianum*, *I. pulchellum*) on ventral surface of stems and branches or just below juncture of leaves, sometimes lacking. Pseudoparaphyllia lacking or present (*I. tenerum*), filamentous, multicellular, of 1 or rarely 2 rows of cells.

Leaves: Stem and branch leaves similar, close, imbricate, flat or concave, smooth or undulate, erect-spreading to squarrose, sometimes secund, occasionally shriveled when dry, symmetric or asymmetric, ovate or lanceolate, sometimes cultriform, acuminate, sometimes abruptly so, nondecurrent or rarely 1–2 cells indistinctly decurrent. Perichaetial leaves sheathing base of seta, oblong-lanceolate, erect, smooth.

Leaf Margins: Plane or recurved at base, serrulate to serrate above leaf middle, serrate to entire below, sometimes entire throughout.

Costae: Double, extending a short distance above base, sometimes lacking.

Leaf Cells: Smooth or minutely prorate on dorsal surface, the walls of medium thickness or thick, pits lacking or walls of basal cells pitted. Median cells fusiform or vermicular, alar cells sometimes differentiated on margins, 1–4 quadrate or rectangular cells present.

Asexual Reproductive Bodies: Usually present and diverse, clustered in leaf axils on stems and branches, 2–6 celled cylindric or fusiform brood bodies or multicellular in the form of twisted-vermiform bodies with 1–5 teeth at apex, as small branchlets resembling parent plant, or as uniseriate, filamentous bodies with papillose cells.

Sex: Autoicous or dioicous. Sex organs unknown on *I. distichaceum*.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, yellow, brown or red, oblong or ovoid, straight or arcuate, erect to cernuous, smooth or wrinkled, often contracted below mouth when dry.

Setae: Straight or flexuose, smooth, usually somewhat twisted when dry, brown, reddish brown or dark red.

Annuli: 2–3 rows of cells, deciduous or rarely persistent, sometimes lacking.

Opercula: Conic to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow to orange, endostome hyaline, 1–3 cilia, nodose, sometimes rudimentary or lacking.

Spores: Green, greenish yellow or yellow, globose to ovoid, smooth or minutely papillose, 7–17 μm in longest dimension.

The North American taxa of *Isopterygium* were studied by Ireland (1969).

1. Plants strongly complanate-foliate, epidermal cells of stems large and thin-walled; leaves often abruptly acuminate; dioicous . . . . 1. *I. muellerianum*
1. Plants weakly complanate-foliate, epidermal cells of stems small and thick-walled; leaves usually gradually acuminate; autoicous or dioicous 2
    2. Pseudoparaphyllia present, filamentous; alar cells on margins usually quadrate or transversely elongate, often over 12 μm wide . . . . 5. *I. tenerum*
    2. Pseudoparaphyllia lacking; alar cells on margins rectangular, seldom quadrate, usually less than 12 μm wide 3
        3. Leaves symmetric, the apical margins entire or rarely minutely serrulate; costae short or indistinct and often lacking; asexual reproductive bodies rarely present, 2–5 celled cylindric or fusiform brood bodies, small, less than 0.1 mm long; autoicous . . . . 2. *I. pulchellum*
        3. Leaves sometimes asymmetric, the apical margins often serrulate to serrate; costae distinct, rarely lacking, often one branch extending 1/3 length of leaves; asexual reproductive bodies common, large, usually more than 0.1 mm long 4

4. Leaves mostly cultriform, seldom symmetric, often undulate; asexual reproductive bodies twisted-vermiform, with 1–5 teeth at apex, rarely any such structures below, commonly borne at or near apices of stems and branches; sex organs unknown .... 4. *I. distichaeceum*

4. Leaves rarely cultriform, mostly symmetric, seldom undulate; asexual reproductive bodies resembling parent plants but smaller, bearing reduced leaves from apex to base of stems, borne throughout stems and branches except at apices; dioicous .... 3. *I. elegans*

1. **Isopterygium muellerianum** (Schimp.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 441. 1878.
Plagiothecium muellerianum Schimp., Syn. 584. 1860.
[Synonym: *Isopterygiopsis muelleriana* (Schimp.) Iwats.]
PLATE 356

Differs from all the other *Isopterygium* species by the stem epidermal cells that are large and thin-walled in cross-section. The strongly complanate plants with abruptly acuminate leaves whose tips are curved upward making the plants dorsally concave are also distinctive. Usually without sporophytes and sometimes reproducing asexually by axillary clusters of 2–6 celled, smooth, cylindric or fusiform, green to yellowish green brood bodies.

Habitat: On moist boulders and cliffs, often beside creeks.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Restigouche, Saint John, York); Nova Scotia (Colchester, Halifax, Inverness, Kings, Victoria).

Range: Labrador to Ontario, south to North Carolina, Tennessee, and Arkansas; disjunct in British Columbia, Yukon Territory, and Alaska. Europe, Asia.

Chromosome Number: n = 11.

Remarks: I have retained *I. muellerianum* in *Isopterygium* rather than place it in the segregate genus *Isopterygiopsis* Iwats. because of its close similarity to other members of the genus, especially *I. pulchellum*. The only major difference between *Isopterygiopsis* and *Isopterygium* is the presence of large, thin-walled epidermal cells in the stems of *I. muellerianum* as opposed to the small, thick-walled epidermal cells occurring in the stems of the other species of *Isopterygium*. *Hypnum* and *Hygrohypnum* are good examples of other genera that have species with both types of stem structure.

2. **Isopterygium pulchellum** (Hedw.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 441. 1878.
Leskea pulchella Hedw., Spec. Musc. 220. 1801.
[Synonym: *Plagiothecium pulchellum* (Hedw.) B.S.G.]
PLATE 357

Distinguished from the other *Isopterygium* species with thick-walled epidermal stem cells and without pseudoparaphyllia by the narrow leaves, never reaching 0.5 mm wide, with entire or nearly entire margins and the cylindric to fusiform brood bodies. The autoicous plants that are weakly complanate and the gradually acuminate leaves aid in separating the species from *I. muellerianum* which has similar asexual reproductive bodies. This is the only species that frequently produces sporophytes.

Habitat: On rock ledges, bluffs and bases of trees.

Maritime Distribution: Frequent. New Brunswick (Albert, Carleton, Restigouche); Nova Scotia (Inverness, Victoria).

Range: Greenland to Alaska, south to New Jersey, Pennsylvania, Michigan, Minnesota, Colorado, Idaho, Arizona, and California. Europe, Asia, *Africa, *Australia, New Zealand.

Chromosome Number: n = 11, 12, 22.

3. **Isopterygium elegans** (Brid.) Lindb., Not. Sällsk. F. Fl. Fenn. Förh. 13: 416. 1874.
Isothecium elegans Brid., Bryol. Univ. 2: 356. 1827.
[Synonyms: *Plagiothecium elegans* (Brid.) Schimp.; *I. borrerrianum* (C. Müll.) Lindb.]
PLATE 358

The most common species of *Isopterygium* in the Maritimes but always without sporophytes. Similar to *I. distichaceum* but the leaves are smooth and symmetric. The asexual reproductive bodies, which are branchlets resembling the parent plant with reduced leaves from apex to base and borne below the stem apices, will further distinguish the two.

Habitat: On soil and humus, often over rock, in shaded places.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Restigouche, Saint John, Westmorland, York); Nova Scotia (Annapolis, Colchester, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria); Prince Edward Island (Kings).

Range: Labrador to Ontario, south to South Carolina, Georgia, Tennessee, and Arkansas; disjunct in Alaska and British Columbia, south to California. Europe, *Asia, *Africa.

Chromosome Number: n = 11.

Remarks: Capsules drawn from Oregon plants.

4. **Isopterygium distichaceum** (Mitt.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 439. 1878.

Stereodon distichaceus Mitt., J. Linn. Soc. Bot. Suppl. 1: 105. 1859.

[Synonyms: *Plagiothecium subfalcatum* Aust.; *I. subfalcatum* (Aust.) Jaeg. & Sauerb., *Taxiphyllum howellianum* Crum & Anders.]

PLATE 359

Somewhat similar to *I. elegans* but not nearly as common. The often undulate, asymmetric, cultriform leaves will immediately distinguish the two. The asexual reproductive bodies will further separate the species when present. They are twisted-vermiform bodies with 1–5 teeth at the apex, commonly borne at or near stem apices in *I. distichaceum*, whereas they are branchlets that resemble the parent plant with reduced leaves from apex to base, borne below the stem apices in *I. elegans*.

Habitat: On wet boulders in woods.

Maritime Distribution: Rare. New Brunswick (Charlotte); Nova Scotia (Annapolis).

Range: Nova Scotia to Ontario, south to South Carolina, Tennessee, Illinois, and Arkansas. Central America, Asia, Australia.

Chromosome Number: Unreported.

Remarks: The upper leaf cells are sometimes minutely prorate on the dorsal surface.

5. **Isopterygium tenerum** (Sw.) Mitt., J. Linn. Soc. Bot. 12: 499. 1869.

Hypnum tenerum Sw., Fl. Ind. Occ. 3: 1817. 1806.

[Synonyms: *Plagiothecium micans* (Sw.) Par.; *I. micans* (Sw.) Kindb.]

PLATE 360

The filamentous pseudoparaphyllia are the best means of recognizing this species from the others in the genus. This is also the only species in the genus whose basal leaf margins have several quadrate to transversely elongate cells that are 10–20 μm wide. The Maritime plants lack sporophytes as well as the uniseriate, filamentous, multicellular, papillose asexual reproductive bodies that are sometimes clustered on the stems of plants from elsewhere.

Habitat: On boulders and banks beside lakes and rivers.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Shelburne).

Range: Southern Nova Scotia to Missouri, south to Florida, Mississippi, Louisiana, and Texas; doubtfully in *Quebec. West Indies, Central and South America.

Chromosome Number: n = 12.

Remarks: This is a common subtropical-tropical species that reaches its northern limit in the Maritimes where it is extremely rare. Drawings of the capsules were made from Florida plants and the asexual reproductive bodies from Louisiana plants.

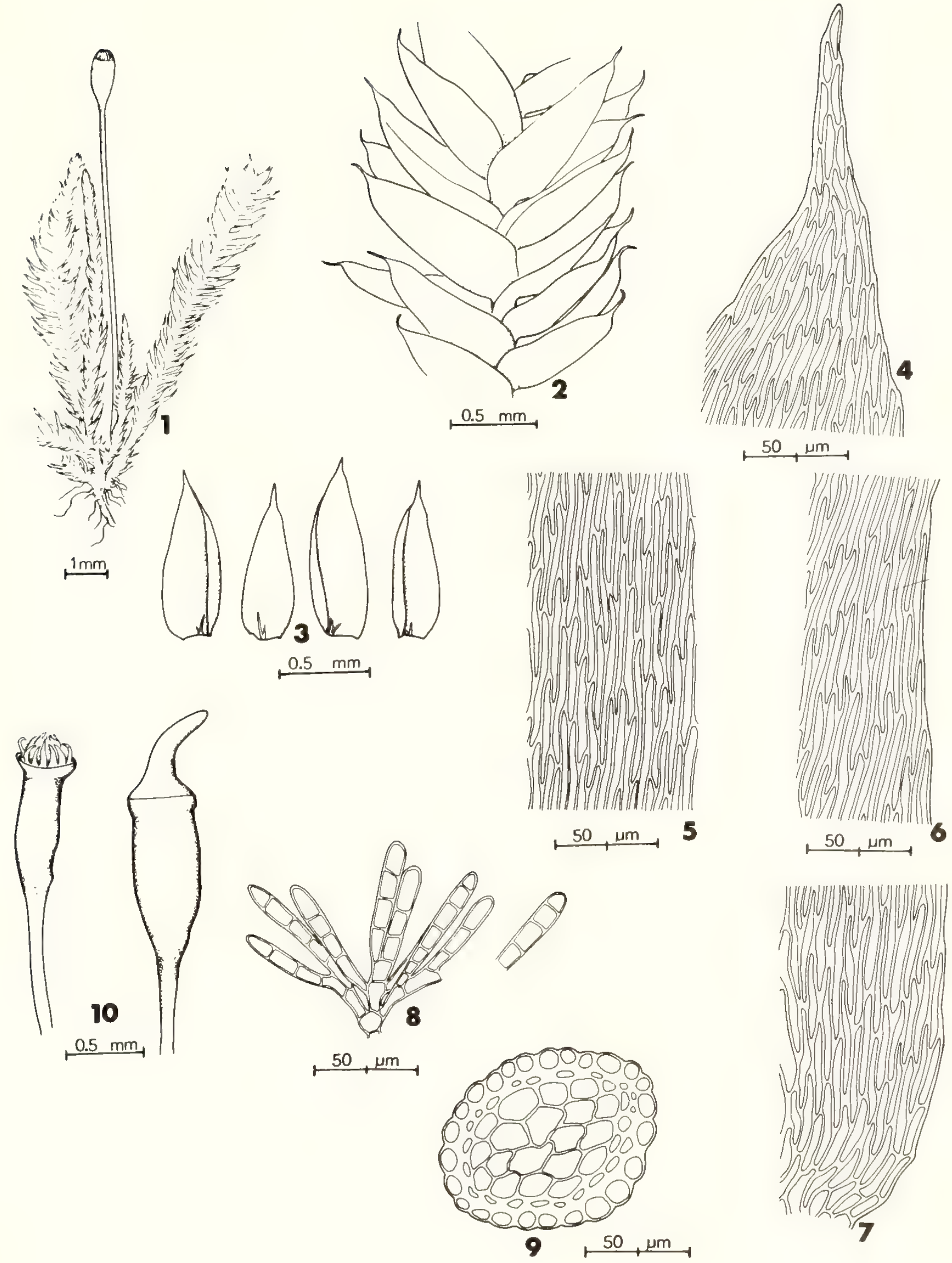
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Plate 356. *Isopterygium muellerianum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Asexual reproductive bodies. 9. Cross-section of stem. 10. Capsules, operculate (wet), inoperculate (dry).

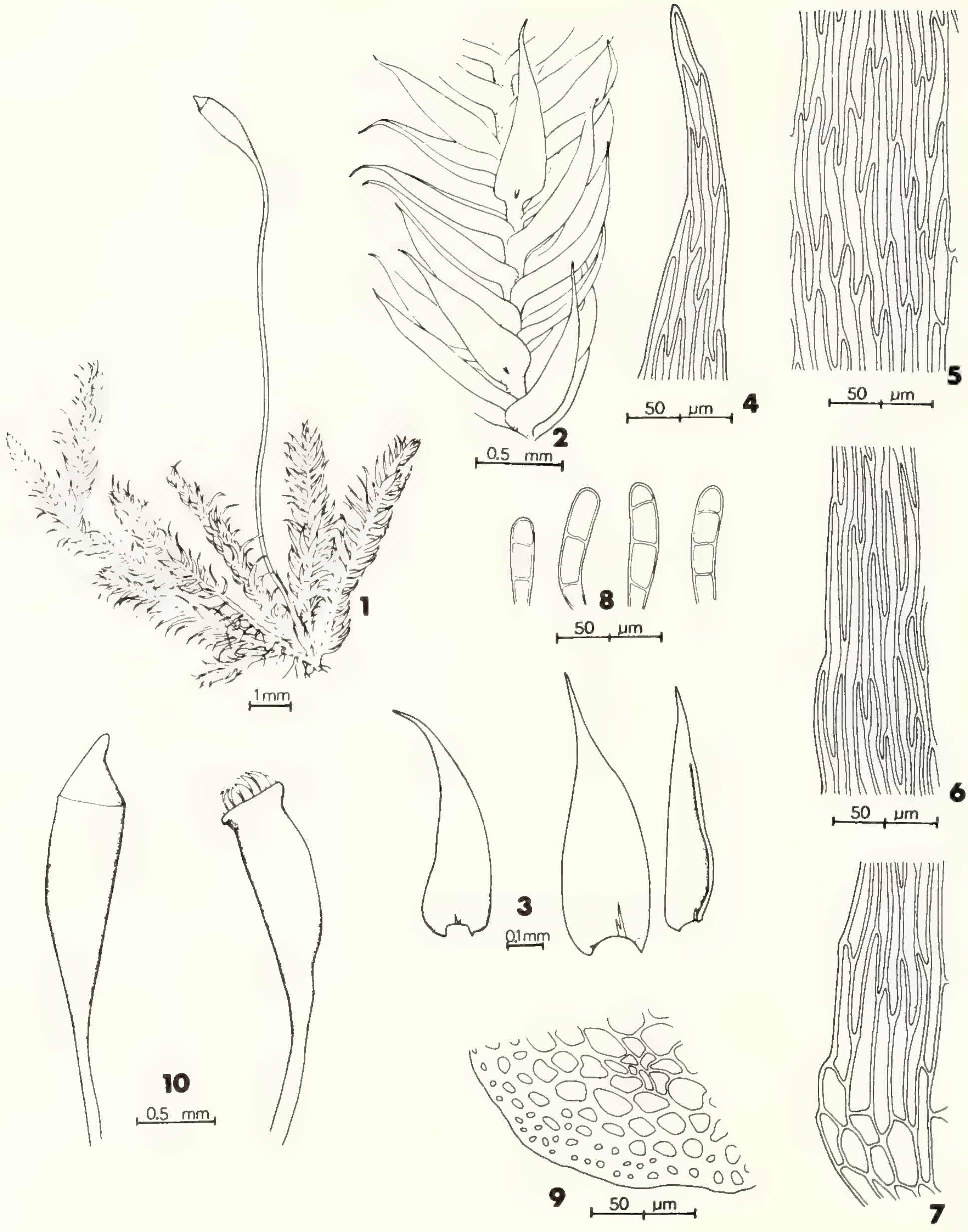
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Plate 357. *Isopterygium pulchellum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Asexual reproductive bodies. 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

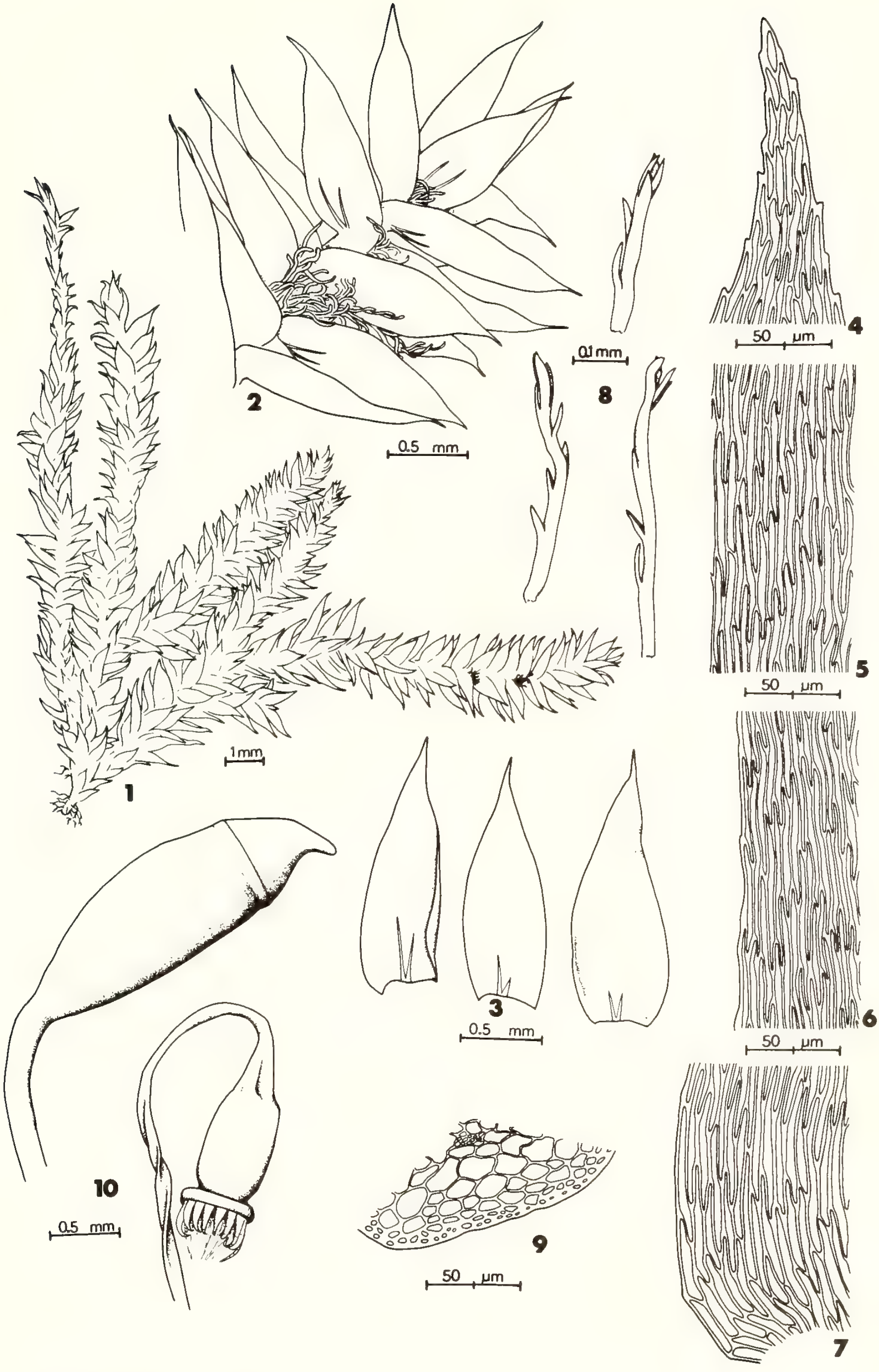
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Plate 358. *Isopterygium elegans*. 1. Habit. 2. Apical portion of stem showing asexual reproductive bodies. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Asexual reproductive branchlets. 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

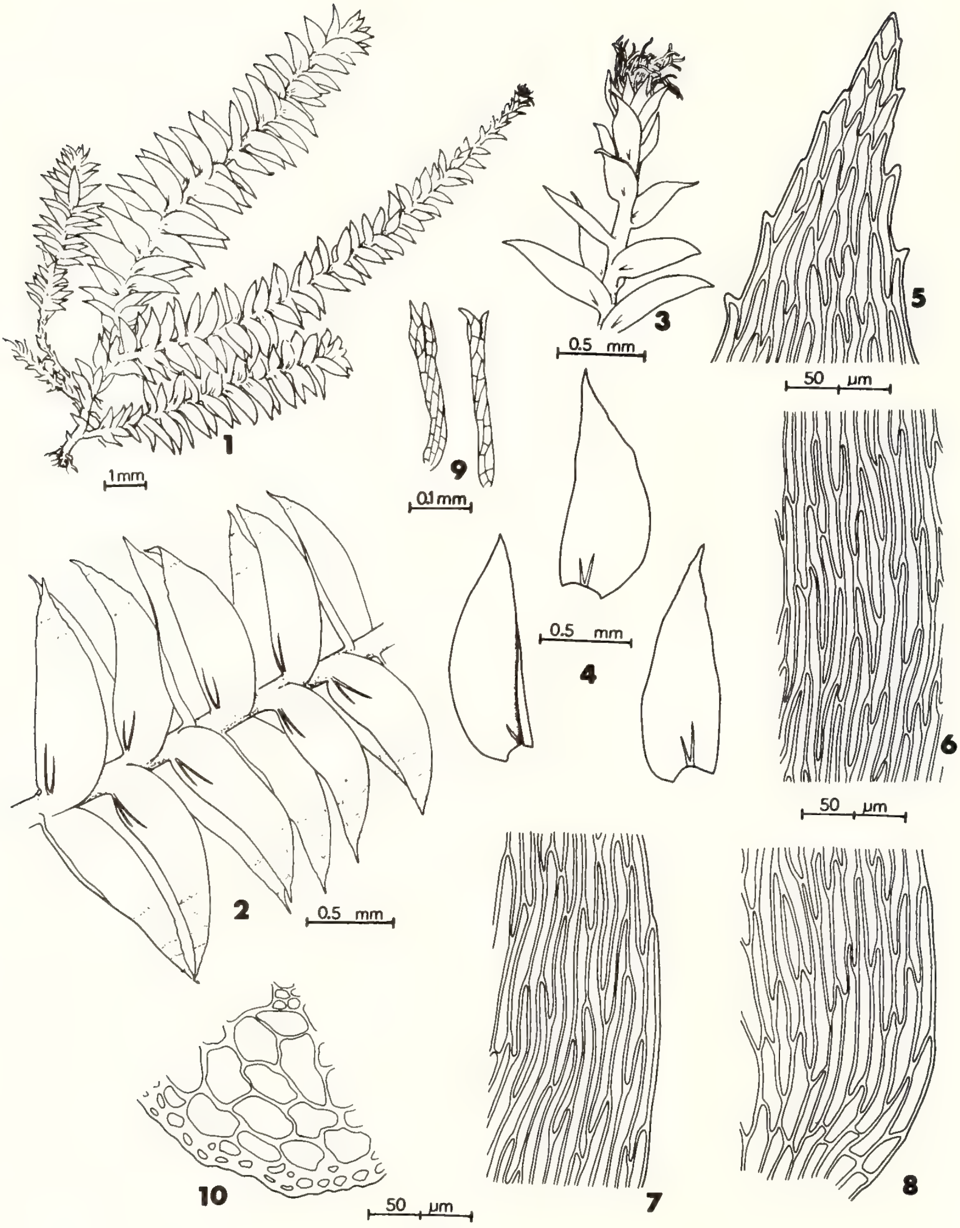
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Plate 359. *Isopterygium distichaceum*. 1. Habit. 2. Portion of stem. 3. Apical portion of stem showing asexual reproductive bodies. 4. Leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Asexual reproductive bodies. 10. Cross-section of portion of stem.

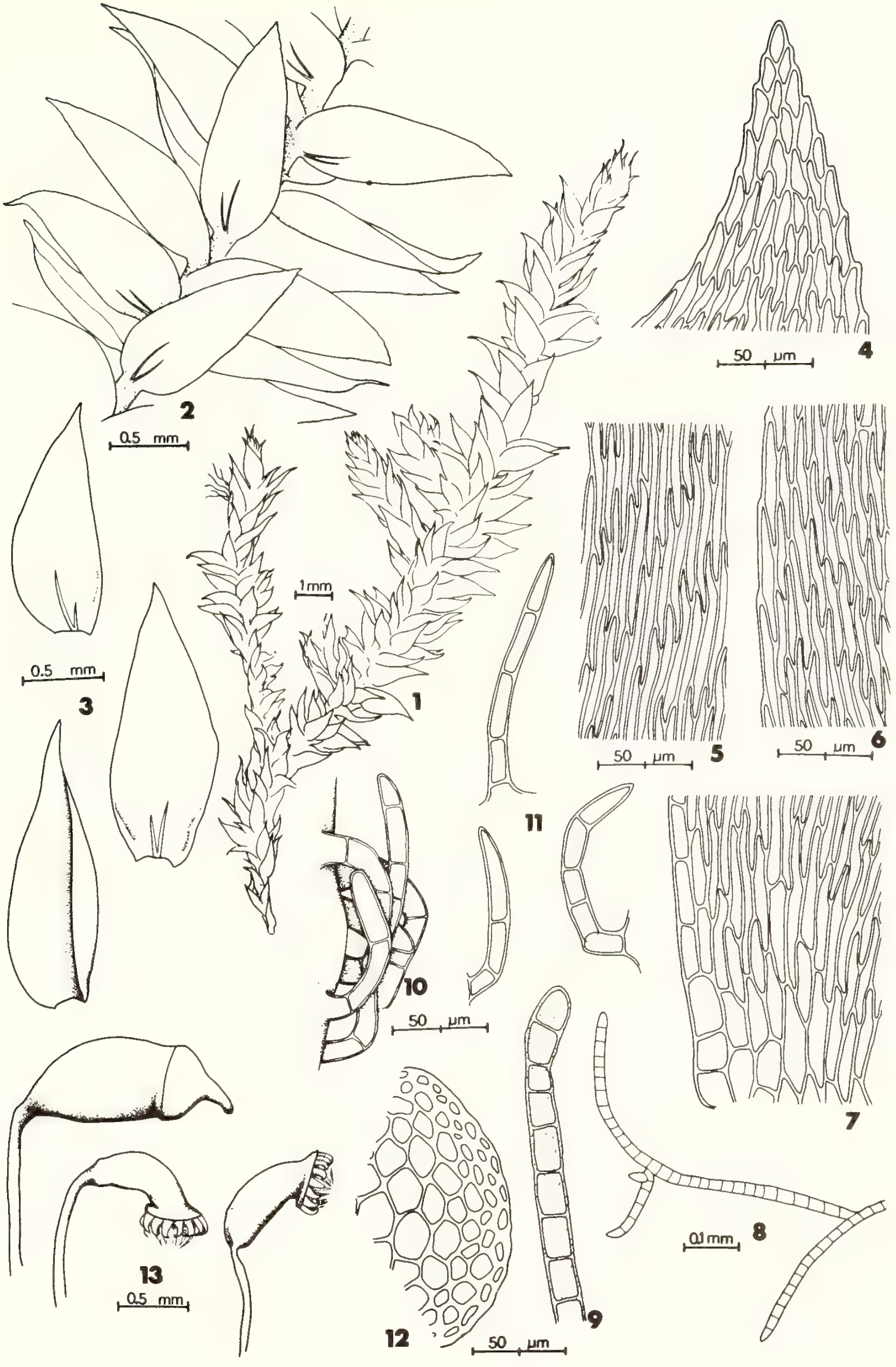
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Plate 360. *Isopterygium tenerum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Asexual reproductive body. 9. Enlargement of apical portion of asexual reproductive body. 10–11. Pseudoparaphyllia. 12. Cross-section of portion of stem. 13. Capsules, operculate (wet), inoperculate (dry).

7. **Taxiphyllum** Fleisch., Musci Fl. Buitenzorg 4: 1434. 1922.

Habit: Prostrate, in thin to dense mats.

Colour: Green to yellowish green or yellowish brown, glossy, sometimes with an oily sheen.

Stems: 1–4 cm long, creeping, sparingly and irregularly branched, complanate-foliate, epidermal cells small and thick-walled in cross-section, rhizoids sparse, smooth, in clusters just below juncture of leaves on ventral surface of stems and branches. Pseudoparaphyllia foliose, lanceolate.

Leaves: Stem and branch leaves similar, close, imbricate, flat to somewhat concave, smooth, erect-spreading to wide-spreading, unchanged when dry, straight, ovate, ovate-lanceolate or oblong-lanceolate, acute to acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, oblong-lanceolate, sometimes abruptly acuminate, erect, smooth.

Leaf Margins: Plane, serrulate to serrate above leaf middle, serrulate below.

Costae: Double, extending a short distance above base, rarely lacking.

Leaf Cells: Smooth, the walls of medium thickness, lacking pits. Median cells fusiform or vermicular, becoming shorter and wider near apex and base, alar cells quadrate to short-rectangular, in 1-several rows with 3–8 cells in marginal row.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Maritime plants not seen with sporophytes.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, light brown to yellowish brown, oblong or ovoid, straight or arcuate, horizontal, smooth, contracted below mouth and wrinkled at neck when dry.

Setae: Flexuose, smooth, twisted when dry, yellowish brown to red.

Annuli: 2 rows of small cells, persistent.

Opercula: Rostrate, arcuate.

Peristomes: Double, hypnaceous, exostome yellow to orange, endostome hyaline, 2–3 cilia, nodose.

Spores: Greenish yellow to yellow, globose to ovoid, smooth or minutely papillose, 10–20 μm in longest dimension.

Ireland (1969) revised *Taxiphyllum* in North America.

1. **Taxiphyllum deplanatum** (Bruch & Schimp. *ex* Sull.) Fleisch., Musci Fl. Buitenzorg 4: 1435. 1922.

Hypnum deplanatum Bruch & Schimp. *ex* Sull., Man. Bot. No. U.S. 670. 1848.

[Synonyms: *Isopterygium deplanatum* (Bruch & Schimp. *ex* Sull.) Mitt.; *Plagiothecium deplanatum* (Bruch & Schimp. *ex* Sull.) Spruce; *Rhynchostegium deplanatum* (Bruch & Schimp. *ex* Sull.) Schimp. *ex* Rau & Herv.]

PLATE 361

Plants small to medium-sized, in thin to dense, green, yellowish green or yellowish brown mats, stems complanate-foliate, sparingly and irregularly branched, up to 4 cm long, leaves 1–2 mm long, imbricate, ovate, ovate-lanceolate or oblong-lanceolate, acute to acuminate, smooth, margins plane, serrulate to serrate above leaf middle, serrulate below, leaf cells smooth, median fusiform or vermicular, alar quadrate to short-rectangular, 3–8 in marginal row, costae short and double; dioicous, Maritime plants unknown with sporophytes, reported to have setae flexuose, yellowish brown to red, 0.7–1.0 cm long, capsules oblong or ovoid, straight or arcuate, horizontal, light brown to yellowish brown, 0.8–1.5 mm long.

Habitat: On rotten wood and wet, usually calcareous, rock bluffs.

Maritime Distribution: Rare. New Brunswick (Albert, Madawaska).

Range: Endemic to North America, from southern New Brunswick to Saskatchewan, south to North Carolina, Tennessee, and Arkansas; also in Alabama, Louisiana, New Mexico, and Arizona. Mexico.

Chromosome Number: Unreported.

Remarks: I have been unable to confirm the presence of *T. deplanatum* in Nova Scotia (Macoun & Kindberg, 1892).

Capsules drawn from Indiana plants.

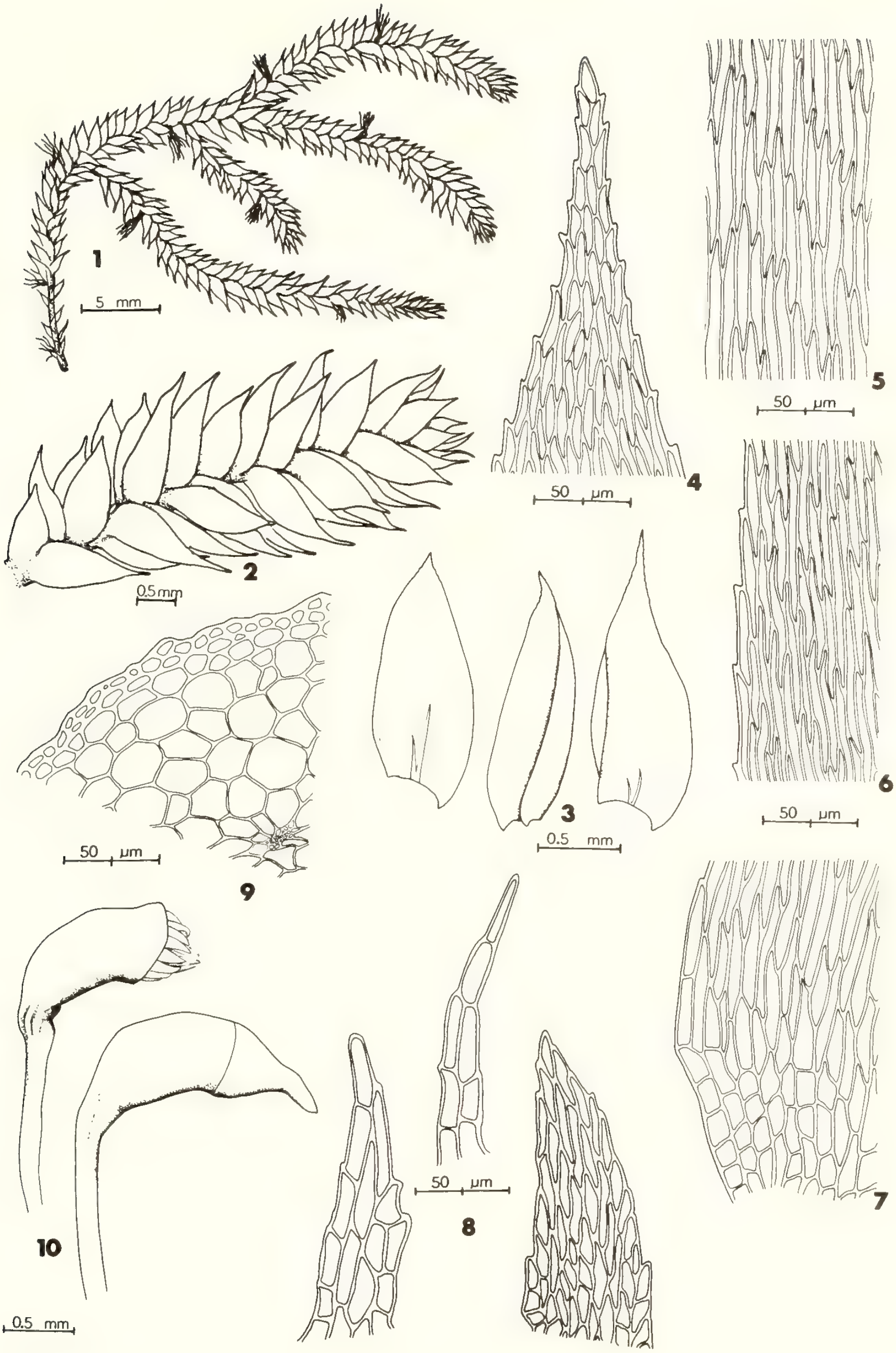
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Plate 361. *Taxiphyllum deplanatum*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Pseudoparaphyllia. 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

8. **Herzogiella** Broth., Nat. Pfl. ed. 2, 11: 466. 1925.

[Synonym: *Sharpiella* Iwats.]

Habit: Prostrate, sometimes with ascending branches, in thin to dense mats.

Colour: Dark green to yellowish green, glossy.

Stems: 1–3 cm long, creeping to somewhat ascending, simple or irregularly branched, epidermal cells large and thin-walled in cross-section, rhizoids sparse, papillose, in clusters in leaf axils (*H. striatella*) or between leaves and rarely in axils (*H. turfacea*) on ventral surface of stems. Pseudoparaphyllia lacking.

Leaves: Stem and branch leaves similar except in size, close to somewhat distant, concave, smooth or weakly plicate, spreading or often squarrose to squarrose-recurved, sometimes secund at apices of stems and branches, ovate to ovate-lanceolate, acuminate, decurrent or nondecurrent. Perichaetial leaves ovate-lanceolate, acuminate, somewhat squarrose, smooth.

Leaf Margins: Plane, serrulate to strongly serrate above leaf middle, serrate to entire below.

Costae: Double, extending $^1/_3$ the length of the leaf, rarely lacking.

Leaf Cells: Smooth, the walls of medium thickness or thick, basal cells usually pitted, sometimes cells above pitted, occasionally pits lacking. Median cells fusiform or vermicular, alar cells quadrate to short-rectangular, decurrent cells abruptly inflated, rounded to oval, thin-walled, hyaline, orange or red.

Asexual Reproductive Bodies: Lacking.

Sex: Autoicous.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, light brown to reddish brown, oblong to cylindric, arcuate, inclined to horizontal, rarely nearly erect, striate and contracted below mouth when dry.

Setae: Straight to flexuose, smooth, often somewhat twisted when dry, light brown to red.

Annuli: 2–3 rows of large cells, deciduous.

Opercula: Conic to conic-apiculate.

Peristomes: Double, hypnaceous, exostome yellow or orange-brown, endostome hyaline, 1–3 cilia, nodulose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–14 μm in longest dimension.

Ireland (1969) revised the genus *Herzogiella* in North America.

1. Leaves strongly decurrent with 2–4 rows of abruptly inflated, hyaline or orange to red cells .... 2. *H. striatella*
1. Leaves not decurrent or 1–3 cells along margins indistinctly decurrent .... 1. *H. turfacea*

1. Herzogiella turfacea (Lindb.) Iwats., J. Hattori Bot. Lab. 33: 375. 1970.
Hypnum turfaceum Lindb., Bot. Not. 1857: 142. 1857.
[Synonyms: *Plagiothecium turfaceum* (Lindb.) Lindb.; *Sharpiella turfacea* (Lindb.) Iwats.]
PLATE 362

Plants differing from *H. striatella* by the more distant leaves that are erect-spreading to widely spreading, often secund at stem and branch apices, lacking the long-decurrent cell regions, and with usually longer median cells, 43–80 μm long, without pits.

Habitat: On rotten tree stumps, logs, bases of trees, humus over boulders, and soil in wet coniferous woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, King's, Madawaska, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Labrador and Newfoundland to Manitoba, south to North Carolina, Tennessee, Michigan, and South Dakota; disjunct to southern Alberta and northwestern Montana. Europe, Asia.

Chromosome Number: n = 11, 12.

2. Herzogiella striatella (Brid.) Iwats., J. Hattori Bot. Lab. 33: 374. 1970.

Leskea striatella Brid., Bryol. Univ. 2: 762. 1827. [Synonyms: *Plagiothecium muehlenbeckii* B.S.G.; *P. striatellum* (Brid.) Lindb.; *Sharpiella striatella* (Brid.) Iwats.]

PLATE 363

Plants distinguished from the preceding by the close, squarrose to squarrose-recurved leaves with 2–4 rows of decurrent cells that are abruptly inflated, hyaline or orange to red, and the usually shorter median cells, 24–50 μm long, often with pits.

Habitat: On humus, rocks, soil over rocks, clay banks, and bases of trees in woods.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Saint John, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Queens, Victoria, Yarmouth, St. Paul Island); Prince Edward Island (Kings, Queens).

Range: Labrador to *Manitoba, south to Florida (?), Tennessee, Wisconsin, and Missouri; disjunct to Alaska, British Columbia, and Washington. Europe.

Chromosome Number: n = 12.

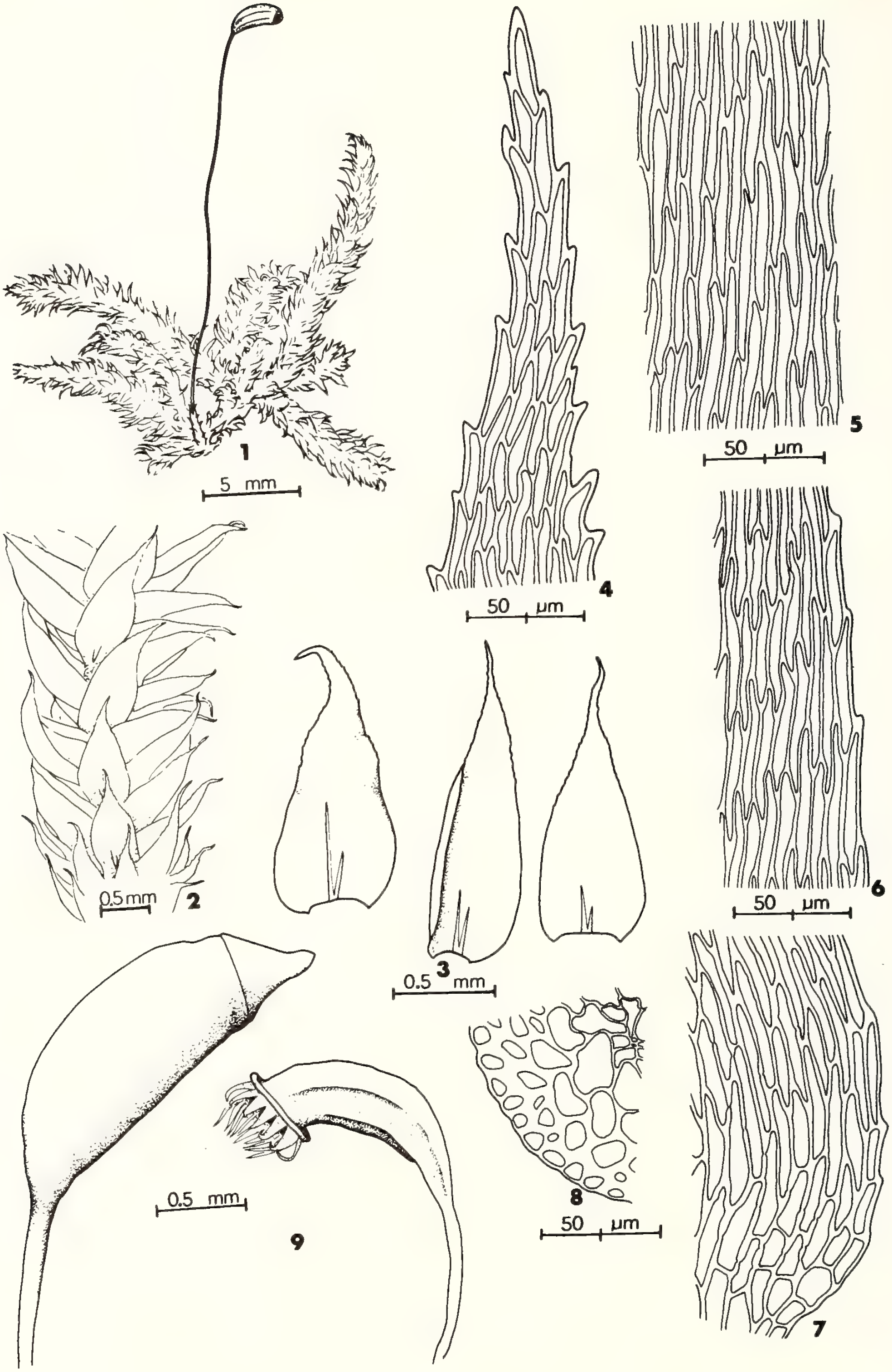
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Plate 362. *Herzogiella turfacea*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry).

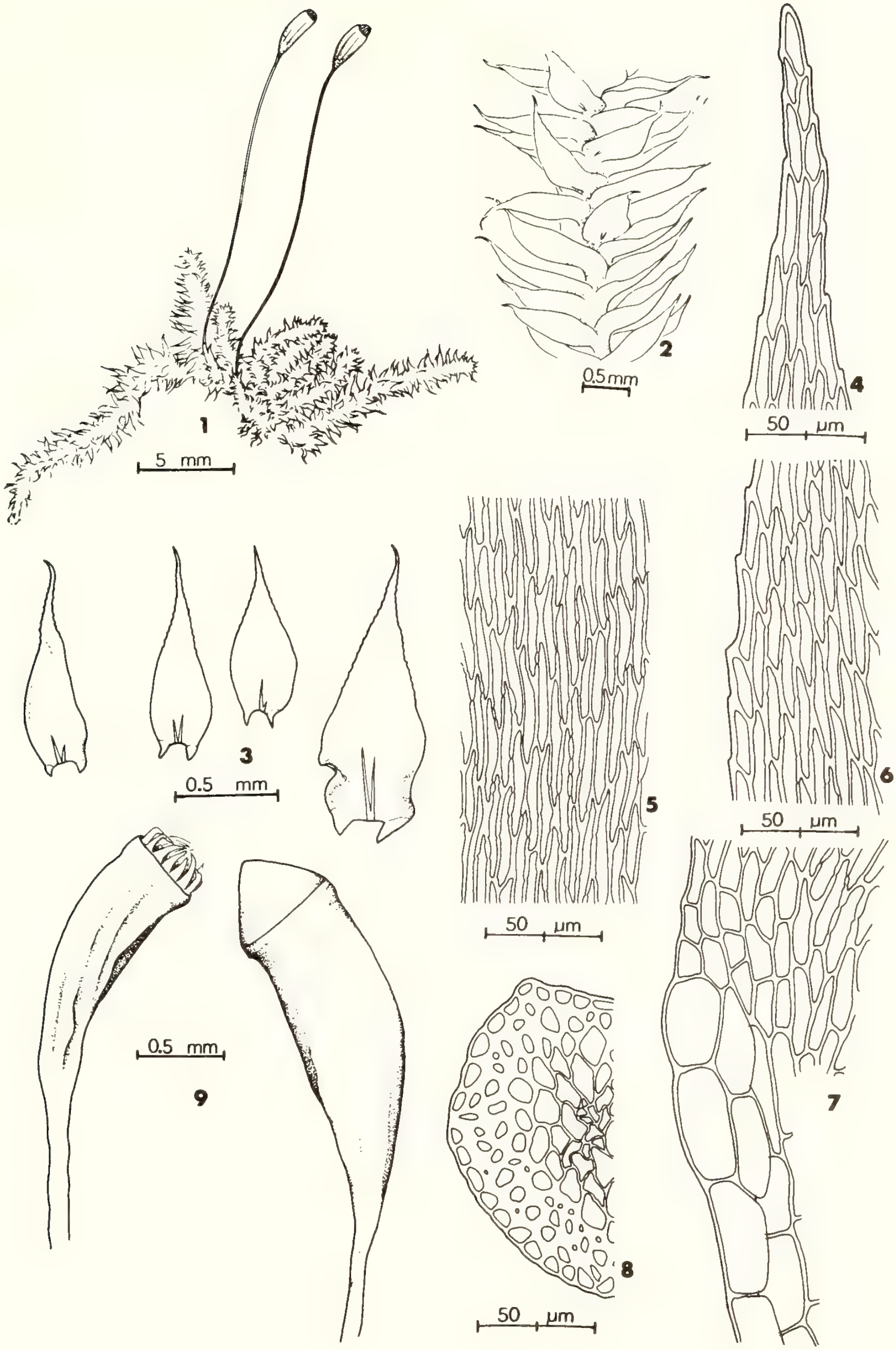
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Plate 363. *Herzogiella striatella*. 1. Habit. 2. Portion of stem. 3. Leaves. 4–7. Leaf cells (4, apical. 5, median. 6, median-marginal. 7, alar.). 8. Cross-section of portion of stem. 9. Capsules, operculate (wet), inoperculate (dry).

9. **Ctenidium** (Schimp.) Mitt., J. Linn. Soc. Bot. 12: 509. 1869.

Hypnum subg. *Ctenidium* Schimp., Syn. 631. 1860.

Habit: Prostrate, in dense mats.

Colour: Green, yellowish or yellowish brown, glossy.

Stems: 2–6 cm long, creeping to somewhat ascending, pinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids sparse, smooth, in clusters just below juncture of leaves on ventral surface of stems. Pseudoparaphyllia foliose, lanceolate.

Leaves: Stem leaves close, concave, rugose, erect-spreading to squarrose, straight to falcate, ovate-cordate, abruptly acuminate, decurrent, branch leaves smaller, falcate-secund, lanceolate, gradually acuminate, shortly decurrent. Perichaetial leaves sheathing base of seta, ovate-lanceolate, erect, smooth.

Leaf Margins: Plane, serrate to base or nearly so.

Costae: Double, extending a short distance above base, sometimes lacking.

Leaf Cells: Prorate on dorsal surface, the walls of medium thickness or thick, basal cells pitted. Median cells fusiform or vermicular, alar cells quadrate, rectangular or irregularly angled.

Asexual Reproductive Bodies: Lacking.

Sex: Pseudomonoicous. Maritime plants lacking sporophytes.

Calyptrae: Cucullate, sparsely hairy.

Capsules: Solitary, on setae scattered along stems, orange to brown, oblong-cylindric, arcuate, inclined to horizontal, smooth, not or somewhat contracted below mouth when dry.

Setae: Flexuose, smooth, not or somewhat twisted when dry, orange to red.

Annuli: Present, large.

Opercula: Long-conic, often apiculate, straight.

Peristomes: Double, hypnaceous, exostome yellow or orange, endostome hyaline, 2–3 cilia, nodose.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 10–14 μm in longest dimension.

1. **Ctenidium molluscum** (Hedw.) Mitt., J. Linn. Soc. Bot. 12: 509. 1869.
Hypnum molluscum Hedw., Spec. Musc. 289. 1801.
PLATE 364

Plants small to medium-sized, in dense, green to yellowish brown mats, stems pinnately branched, up to 6 cm long, stem leaves 1–2 mm long, erect-spreading to squarrose, ovate-cordate, decurrent, abruptly acuminate, rugose, margins plane, serrate to base or nearly so, branch leaves 1.0–1.5 mm long, falcate-secund, lanceolate, gradually acuminate, leaf cells prorate on dorsal surface, median fusiform or vermicular, alar quadrate, rectangular or irregularly angled, costae short and double; pseudomonoicous, Maritime plants unknown with sporophytes, reported to have setae flexuose, orange to red, 1.3–2.0 cm long, capsules oblong-cylindric, arcuate, inclined to horizontal, orange to brown, ca. 2 mm long.

Habitat: On soil, humus and boulders in woods.

Maritime Distribution: Rare. Nova Scotia (Annapolis, Colchester, Inverness, Kings).

Range: *Newfoundland to Ontario, south to South Carolina, Alabama, and Louisiana; disjunct to British Columbia and Alaska. *South America, Europe, *Asia, *Africa.

Chromosome Number: n = 7, 8, 10, 11.

Remarks: Dwarf male plants are extremely rare and this is probably the reason for the lack of sporophytes in the Maritimes since there is an abundance of plants with female organs.

Capsules drawn from Tennessee plants.

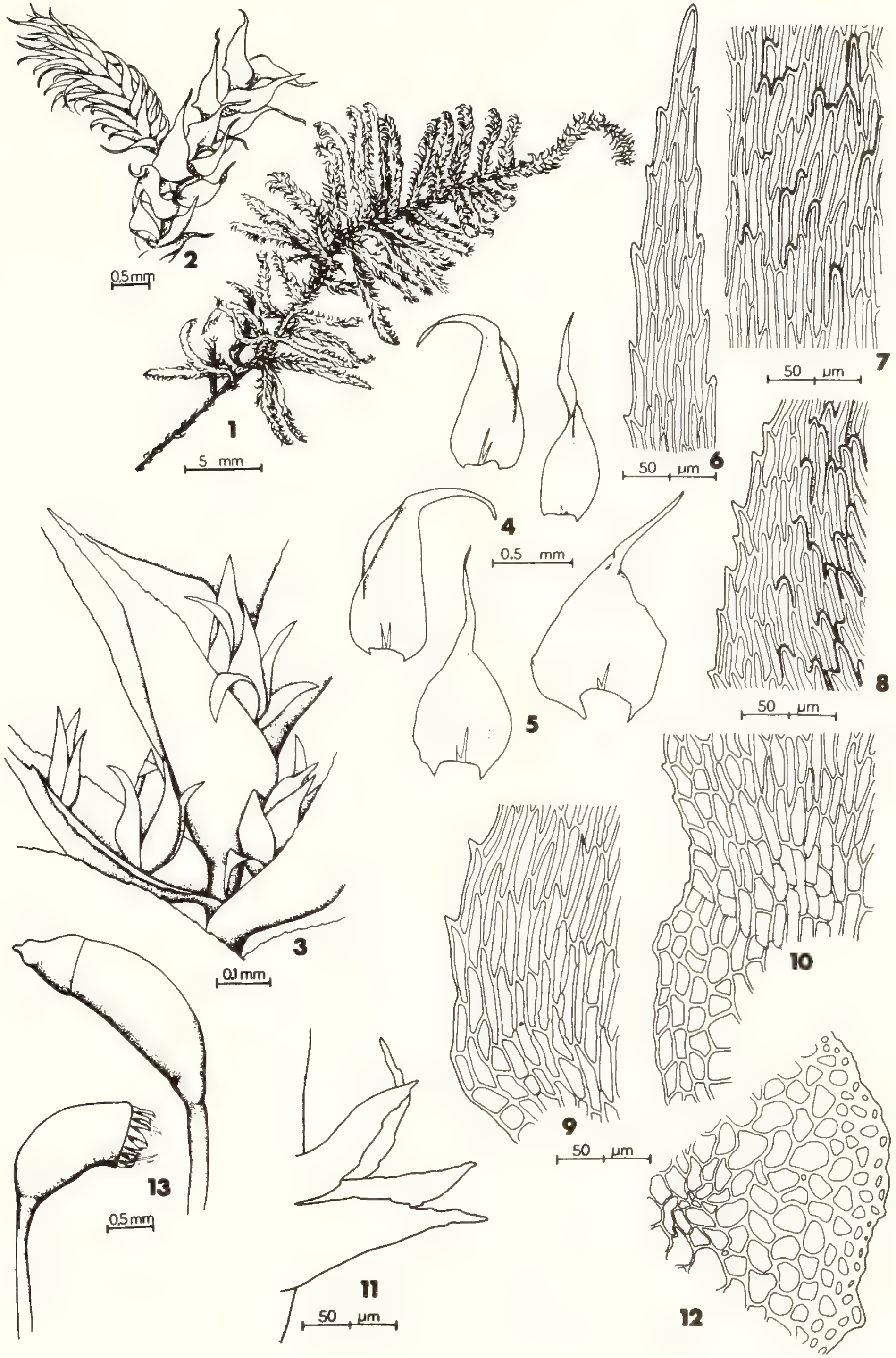
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Plate 364. *Ctenidium molluscum*. 1. Habit. 2. Portion of stem and branch. 3. Dwarf male plants on leaves of female plants. 4. Branch leaves. 5. Stem leaves. 6–10. Leaf cells (6, apical of stem leaf. 7, median of stem leaf. 8, median-marginal of stem leaf. 9, alar of branch leaf. 10, alar of stem leaf.). 11. Pseudoparaphyllia. 12. Cross-section of portion of stem. 13. Capsules (dry).

10. **Ptilium** De Not., Cronac. Briol. Ital. 2: 17. 1867.

Habit: Suberect, in loose tufts or mats.

Colour: Green to yellowish green, brownish green below, glossy.

Stems: 3–10 cm long, erect-ascending, pinnately branched, plumose, branches becoming progressively shorter near stem apices, epidermal cells small and thick-walled in cross-section, rhizoids sparse, smooth, in clusters just below juncture of leaves at or near tips of branches. Pseudoparaphyllia foliose, narrowly lanceolate.

Leaves: Stem and branch leaves similar except in size, close, concave, plicate, spreading to nearly squarrose, unchanged when dry, falcate-secund, ovate- to oblong-lanceolate, acuminate, decurrent. Perichaetial leaves sheathing base of seta, elongate, oblong-lanceolate, erect, plicate.

Leaf Margins: Plane or recurved from base to middle, serrulate to serrate above, entire below.

Costae: Double, strong in the stem leaves, extending 1/2 the length of the leaf, short and often lacking in the branch leaves.

Leaf Cells: Smooth, the walls of medium thickness or thick, pitted, especially near base. Median cells fusiform or vermicular, alar cells differentiated, mostly rectangular or square, few.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, oblong-cylindric, arcuate, horizontal, smooth, slightly contracted below mouth when dry.

Setae: Flexuose, smooth, usually somewhat twisted when dry, orange to red.

Annuli: 1 row of small cells, deciduous.

Opercula: Conic, apiculate.

Peristomes: Double, hypnaceous, exostome orange to brown, endostome hyaline to yellow, 1–4 cilia, nodulose.

Spores: Greenish yellow to yellow, globose to ovoid, smooth or minutely papillose, 10–15 μm in longest dimension.

1. **Ptilium crista-castrensis** (Hedw.) De Not., Cronac. Briol. Ital. 2: 17. 1867.
Hypnum crista-castrensis Hedw., Spec. Musc. 287. 1801.
PLATE 365

Plants large, in loose, green to yellowish green tufts or mats, stems suberect, pinnately branched, plumose, up to 10 cm long, stem leaves 2–3 mm long, branch leaves 1–2 mm long, strongly falcate-secund, ovate to oblong-lanceolate, acuminate, plicate, margins recurved from base to middle, serrulate to serrate above, leaf cells smooth, median fusiform or vermicular, alar rectangular or square, few on margins, costae short and double; dioicous, setae flexuose, orange to red, 2–5 cm long, capsules oblong-cylindric, arcuate, horizontal, brown to reddish brown, 2–3 mm long.

Habitat: On soil, humus, boulders, cliffs and rotten logs in moist coniferous woods.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Northumberland, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: Labrador to Alaska, south to North Carolina, Tennessee, Michigan, Iowa, Montana, Idaho, and *Oregon. Europe, Asia.

Chromosome Number: n = 10, 11.

Remarks: A large and beautiful moss that is common throughout Canada, especially in the Boreal Forest Region. The suberect, pinnately branched stems, which are plumose and bear falcate-secund, plicate leaves, are distinctive. Commonly known as the "Plume Moss" or "Knight's Plume".

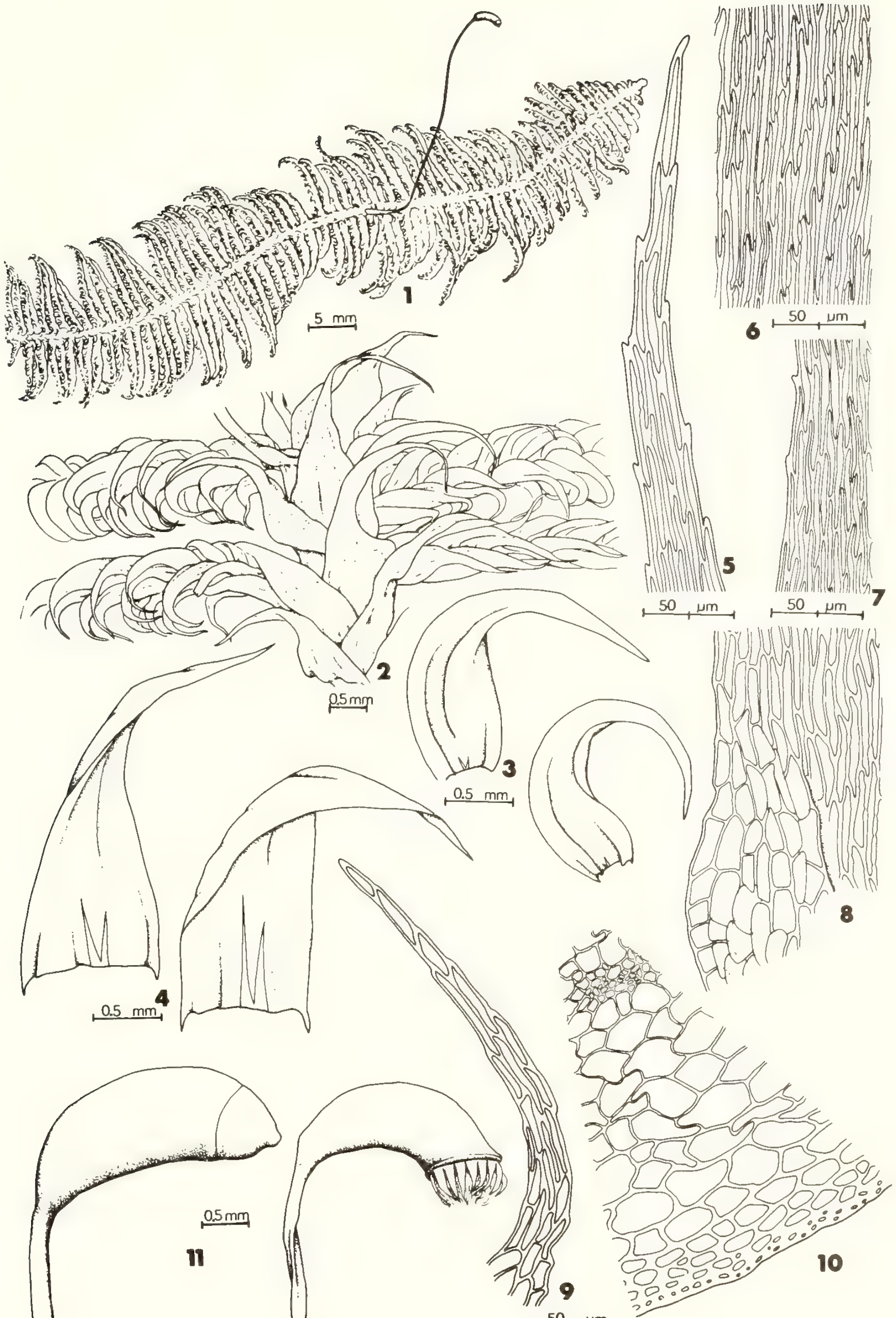
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Plate 365. *Ptilium crista-castrensis*. 1. Habit. 2. Portion of stem and branches. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Pseudoparaphyllium. 10. Cross-section of portion of stem. 11. Capsules, operculate (wet), inoperculate (dry).

1. Costae single; leaf margins recurved to revolute nearly to apex .... 1. *Rhytidium* (p. 638)
1. Costae double; leaf margins plane or recurved only at base .... 2. *Rhytidiadelphus* (p. 640)

1. **Rhytidium** (Sull.) Kindb., Bih. K. Svenske Vet. Ak. Handl. 6(19): 8. 1882.

Hypnum sect. *Rhytidium* Sull., Man. Bot. No. U.S. ed. 2: 675. 1856.

Habit: Prostrate to ascending, in loose mats.

Colour: Yellowish green to yellowish brown, dull or glossy.

Stems: 4–8 cm long, yellow to orange, creeping to ascending, nearly pinnately branched, branches attenuate, sometimes sparsely and irregularly branched, tips of stems and branches often arcuate, epidermal cells small and thick-walled in cross-section, rhizoids smooth, sparse, in clusters at tips of branches. Pseudoparaphyllia foliose, narrowly lanceolate.

Leaves: Stem and branch leaves nearly similar, erect, stem leaves usually falcate-secund, close, imbricate, concave, strongly rugose and plicate, scarcely changed when dry, ovate- to oblong-lanceolate, acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, oblong-lanceolate, long-acuminate, smooth to plicate.

Leaf Margins: Recurved to revolute nearly to apex, serrulate to serrate primarily in upper half, entire below.

Costae: Single, extending to leaf middle or above, often prominent on dorsal surface.

Leaf Cells: Prorate to spinose-prorate above on dorsal surface, the walls thick or of medium thickness, usually pitted throughout. Median cells fusiform or vermicular, alar cells differentiated, rounded-quadrate or -rectangular, thicker walled, numerous, extending some distance toward costa and up the leaf margins.

Asexual Reproductive Bodies: Lacking.

Sex: Reported as dioicous. Sex organs and sporophytes unknown on Maritime plants.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, brown, oblong-ovoid to cylindric, arcuate, inclined to horizontal, smooth, sometimes contracted below mouth when dry.

Setae: Straight to slightly flexuose, smooth, scarcely twisted when dry, red.

Annuli: 3 rows of cells, deciduous.

Opercula: Conic to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome dark yellow to orange, endostome yellow or hyaline, 1–3 cilia, nodulose.

Spores: Green to yellowish brown, globose to ovoid, minutely papillose, 10–16 μm in longest dimension.

1. **Rhytidium rugosum** (Hedw.) Kindb., Bih. K. Svenske Vet. Ak. Handl. 7(9): 15. 1883.
Hypnum rugosum Hedw., Spec. Musc. 293. 1801.
PLATE 366

This is the only species of the genus in the world. Easily recognized on sight by the plants yellowish green to yellowish brown colour, the pinnately branched stems, 4–8 cm long, and the close, often falcate-secund, strongly rugose and plicate leaves, 3–4 mm long, that have a single costa. Rarely fruiting and unknown with sporophytes from the Maritimes.

Habitat: On dry, exposed cliffs (apparently calcareous).

Maritime Distribution: Rare. Nova Scotia (Cumberland, Victoria).

Range: Greenland to Alaska, south to North Carolina, Tennessee, Missouri, South Dakota, Colorado, and Arizona. Central and South America, Europe, Asia, *Africa.

Chromosome Number: n = 10.

Remarks: *Rhytidium rugosum*, which is unknown with sex organs and sporophytes in the Maritimes, rarely produces them anywhere. In North America sporophytes are known on plants from the Yukon Territory, Colorado (Grout, 1928–34), and Ontario (used for the capsule drawing).

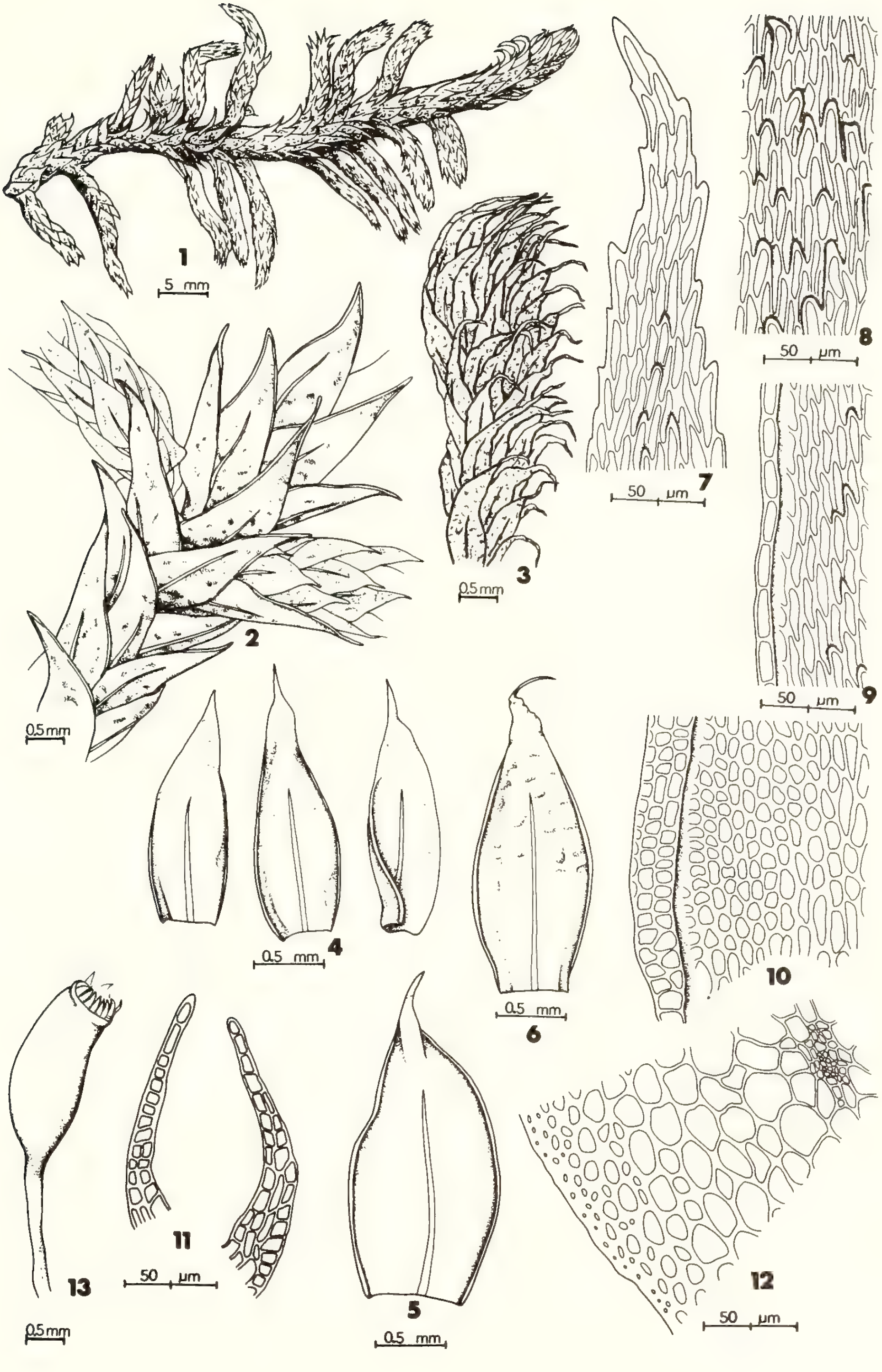
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Plate 366. *Rhytidium rugosum*. 1. Habit. 2. Portion of stem and branches (wet). 3. Side view of apical portion of stem (dry). 4. Branch leaves (wet). 5. Stem leaf (wet). 6. Stem leaf (dry). 7–10. Leaf cells (7, apical of branch leaf. 8, median of stem leaf. 9, median-marginal of stem leaf. 10, alar of stem leaf.). 11. Pseudoparaphyllia. 12. Cross-section of portion of stem. 13. Capsule (dry).

2. **Rhytidiadelphus** (Lindb. *ex* Limpr.) Warnst., Krypt. Fl. Brandenburg 2: 842. 1906.
Hylocomium subg. *Rhytidiadelphus* Lindb. *ex* Limpr., Laubm. Deutschl. 3: 590. 1901.

Habit: Prostrate to decumbent, in loose to dense mats.

Colour: Green, yellowish green or yellowish brown, dull or glossy.

Stems: 4–15 cm long, orange to red, creeping to ascending, irregularly to subpinnately branched, epidermal cells small and thick-walled in cross-section, rhizoids smooth, sparse, in clusters at tips of branches or on ventral surface of stems. Pseudoparaphyllia lacking.

Leaves: Stem and branch leaves erect to erect-spreading or falcate-secund, sometimes stem leaves squarrose to squarrose-recurved, usually close, concave, smooth or plicate, sometimes rugose near apex, scarcely changed when dry, ovate- to oblong-lanceolate, stem leaves with a broad, ovate or cordate base, acute to acuminate, nondecurrent. Perichaetial leaves sheathing base of seta, oblong-lanceolate, long-acuminate, squarrose at tips, smooth, often yellowish.

Leaf Margins: Plane, often somewhat recurved at base, serrulate to serrate, sometimes entire near base.

Costae: Double, short or reaching to above leaf middle, sometimes lacking.

Leaf Cells: Smooth or prorate to spinose-prorate above on dorsal surface, the walls of medium thickness or thick, pitted throughout or pitted only at leaf base. Median cells fusiform or vermicular, alar cells sometimes differentiated, enlarged and rectangular.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, reddish brown, ovoid to oblong-ovoid, arcuate, horizontal, wrinkled to striate when dry and sometimes slightly contracted below mouth.

Setae: Flexuose, smooth, twisted when dry, red to reddish brown.

Annuli: 2–3 rows of cells, persistent or deciduous.

Opercula: Conic-apiculate, straight.

Peristomes: Double, hypnaceous, exostome dark yellow to orange, endostome yellow or hyaline, 1–3 cilia, nodulose.

Spores: Green to yellowish brown, globose to ovoid, minutely papillose to smooth, 12–28 μm in longest dimension.

1. Stem leaves smooth, strongly squarrose to squarrose-recurved .... 1. *R. subpinnatus*
1. Stem leaves plicate, not or weakly squarrose 2
    2. Leaves rugose near apex, noticeably crowded near stem apices; leaf cells spinose-prorate dorsally; costae strong, extending to middle of leaves or above ... 3. *R. triquetrus*
    2. Leaves neither rugose nor noticeably crowded at stem apices; leaf cells smooth; costae lacking or weak, ending below middle of leaves .... 2. *R. loreus*

1. Rhytidiadelphus subpinnatus (Lindb.) Kop., Hikobia 6(1–2): 19. 1971.
Hylocomium subpinnatum Lindb., Hedwigia 6: 41. 1867.
[Synonyms: *Hylocomium calvescens* Lindb.; *R. calvescens* (Lindb.) Broth.; *R. squarrosus* var. *calvescens* (Lindb.) Warnst.]
PLATE 367

The smooth, strongly squarrose to squarrose-recurved stem leaves will distinguish this species from the other two Maritime *Rhytidiadelphus* species. The plants prefer wetter habitats than the other two taxa.

Habitat: On humus, soil, logs and wet boulders in woods, swamps and wet meadows, or sometimes on sandy soil beside rivers and lakes.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Madawaska, Northumberland, Queen's, Restigouche, Saint John, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Labrador to Ontario; also in *Alaska, Alberta, British Columbia, *Massachusetts, *New Hampshire, Tennessee, *Oregon, and Washington. Europe, *Asia, *Africa.

Chromosome Number: n = 10.

Remarks: Koponen (1971) studied the taxonomy of this species which has been confused with *R. squarrosus* (Hedw.) Warnst., a moss known in North America only from Alaska and British Columbia.

2. **Rhytidiadelphus loreus** (Hedw.) Warnst., Krypt. Fl. Brandenburg 2: 922. 1906.
Hypnum loreum Hedw., Spec. Musc. 294. 1801.
[Synonym: *Hylocomium loreum* (Hedw.) B.S.G.]
PLATE 368

Plants somewhat like *R. subpinnatus* but with plicate leaves that are falcate-secund instead of smooth and squarrose. The species differs from *R. triquetrus* in the nonrugose leaves that are not crowded at the stem apices, the weak costae that end below the leaf middle, and the smooth leaf cells. Also, the leaf plications are stronger in *R. loreus* but they end near the middle of the leaves, whereas in *R. triquetrus* the plications are weak but they extend far above the leaf middle.

Habitat: On old logs, humus and shaded wet rocks.

Maritime Distribution: Frequent. Nova Scotia (Guysborough, Halifax, Inverness, Victoria, Yarmouth).

Range: Predominantly with an oceanic distribution, occurring on both coasts of North America. In the East from Labrador south to Nova Scotia and in the West from Alaska to California; also in Idaho, Montana, *Ontario (?), *Alberta (?), and *Yukon Territory. Europe.

Chromosome Number: n = 5.

3. **Rhytidiadelphus triquetrus** (Hedw.) Warnst., Krypt. Fl. Brandenburg 2: 920. 1906.
Hypnum triquetrum Hedw., Spec. Musc. 256. 1801.
[Synonym: *Hylocomium triquetrum* (Hedw.) B.S.G.]
PLATE 369

The rugose and plicate leaves that are noticeably crowded near the stem apices, the costae that extend to the leaf middle or above and the leaf cells that are spinose-prorate dorsally will separate this large moss from the others in the genus.

Habitat: On humus, soil and rotten logs in woods; rarely on gypsum outcrops.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Queen's, Restigouche, Victoria, Westmorland, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Pictou, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Labrador to Alaska, south to *Florida, Tennessee, Arkansas, Montana, Idaho, and California. Europe, Asia.

Chromosome Number: n = 5, 6.

Remarks: "Rough Neck Moss" and "Shaggy Moss" are the common names sometimes applied to this species.

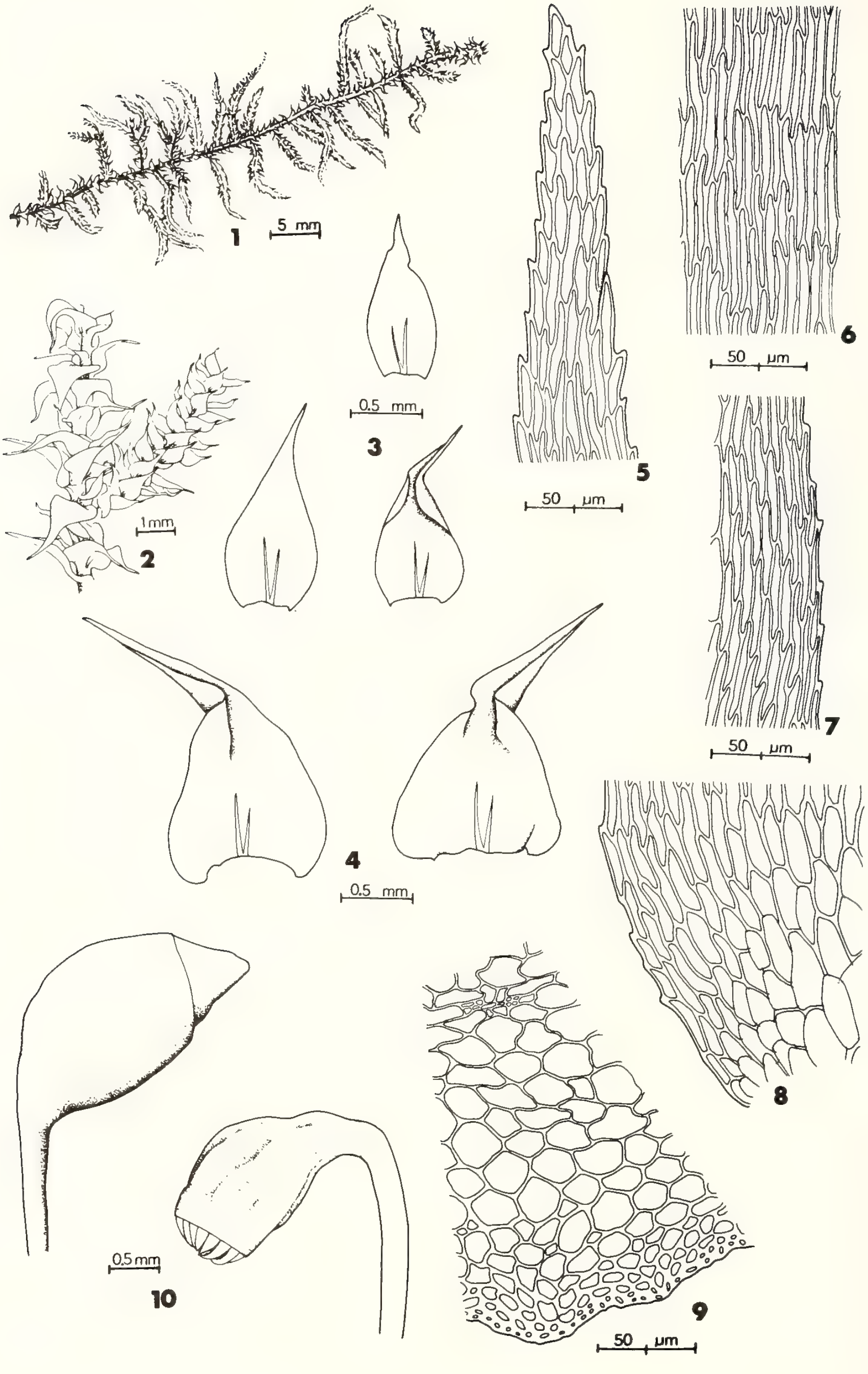
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Plate 367. *Rhytidiadelphus subpinnatus*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of portion of stem. 10. Capsules, operculate (wet), inoperculate (dry).

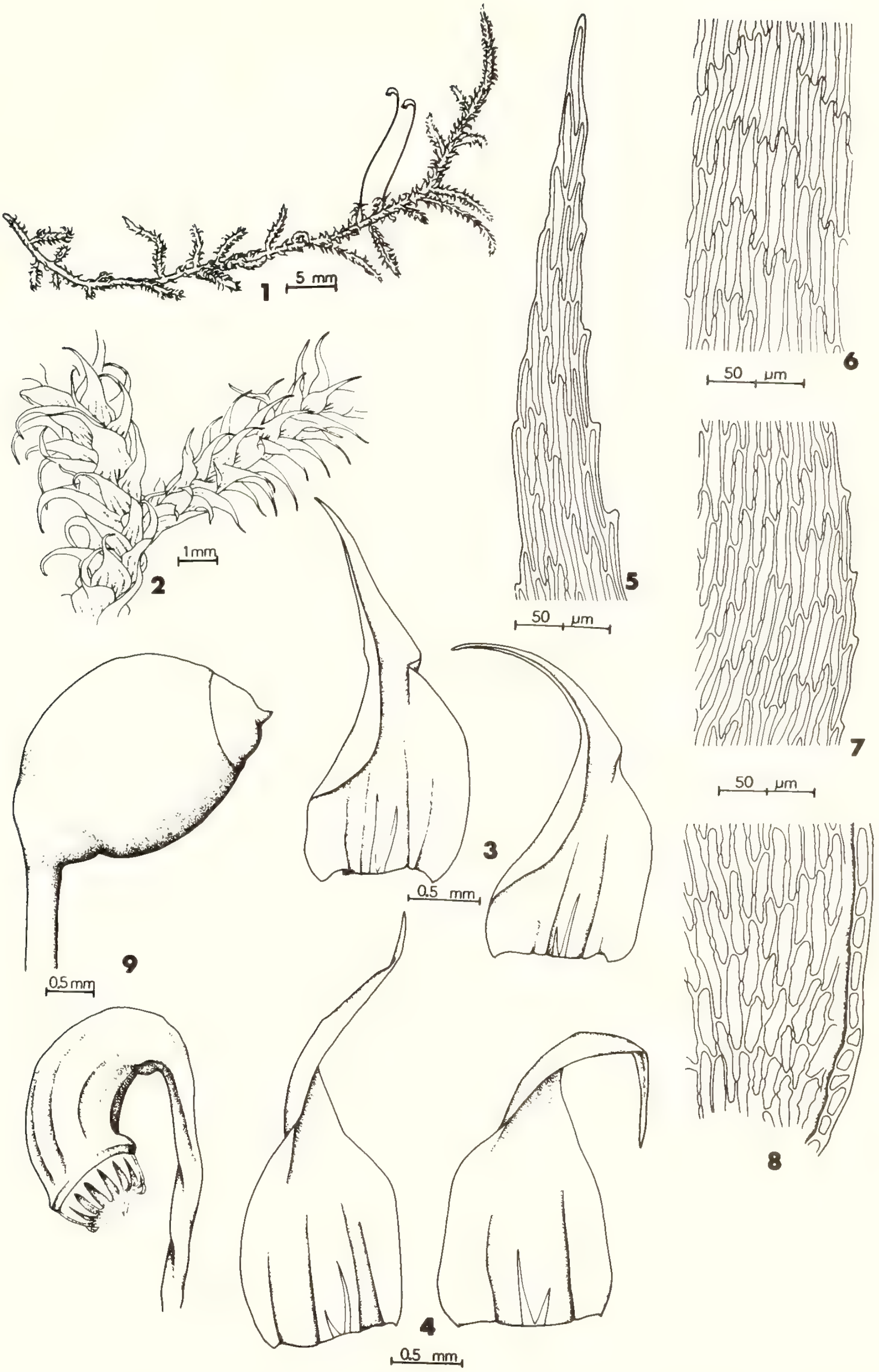
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Plate 368. *Rhytidiadelphus loreus*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaves. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

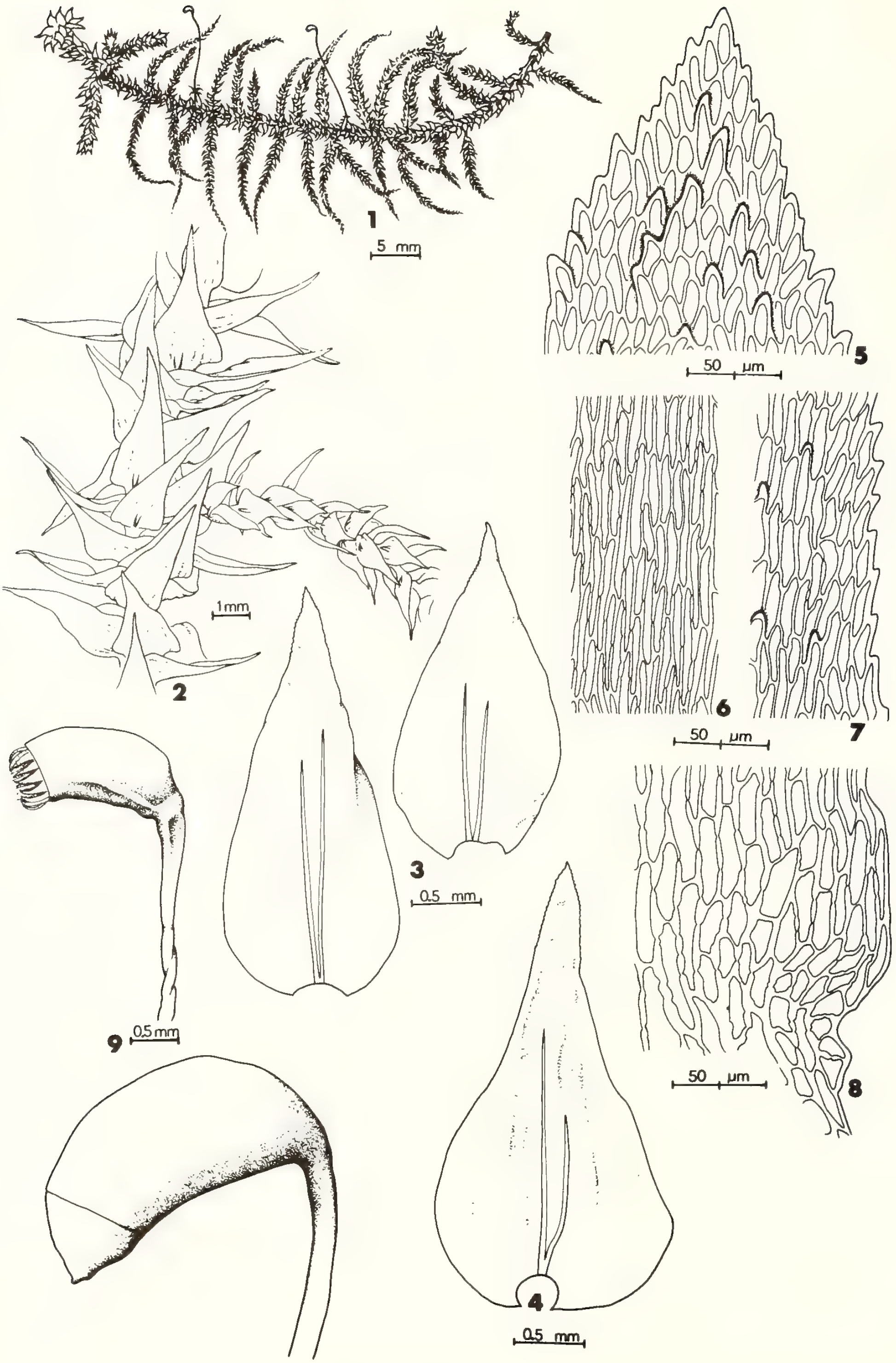
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Plate 369. *Rhytidiadelphus triquetrus*. 1. Habit. 2. Portion of stem and branch. 3. Branch leaves. 4. Stem leaf. 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Capsules, operculate (wet), inoperculate (dry).

Hylocomium B.S.G., Bryol. Eur. 5: 169. 1852 (fasc. 49–51 Mon. 1).

Habit: Prostrate to ascending, in loose to dense mats or tufts.

Colour: Green, yellowish green or yellowish brown, glossy.

Stems: 5–15 cm long, red, creeping to ascending, irregularly pinnate to regularly bi- to tri-pinnate, often frondose and with arched, ascending innovations arising from previous season's growth, epidermal cells small and thick-walled in cross-section, rhizoids smooth, sparse, in clusters between leaves on ventral surface of stems. Paraphyllia numerous, covering stems and branches, filiform, branched.

Leaves: Stem leaves erect to erect-spreading, occasionally squarrose, distant to close, concave, plicate, scarcely changed when dry, ovate, ovate-lanceolate or oblong-ovate, acuminate, often abruptly so, acumen sometimes undulate, nondecurrent, branch leaves nearly similar but smaller, erect to erect-spreading, close, acute to acuminate, acumen not undulate. Perichaetial leaves sheathing base of seta, oblong-lanceolate, long-acuminate, squarrose at tips, smooth, often yellowish.

Leaf Margins: Plane above, often recurved below, serrulate to serrate throughout.

Costae: Single or double, sometimes extending to leaf middle or above.

Leaf Cells: Smooth or prorate on dorsal surface, the walls of medium thickness or thick, mostly pitted. Median cells fusiform or vermicular, alar cells scarcely differentiated, a few quadrate or rectangular cells mainly on margins.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, white to yellow.

Capsules: Solitary, on setae scattered along stems, brown to reddish brown, ovoid, oblong-ovoid or oblong-cylindric, straight to arcuate, inclined to horizontal, smooth, sometimes wrinkled and usually contracted below mouth when dry.

Setae: Flexuose, smooth, twisted when dry, red to reddish brown.

Annuli: 2 rows of cells, persistent or deciduous, often lacking (*H. brevirostre, H. umbratum*).

Opercula: High-conic to short-rostrate, straight to arcuate.

Peristomes: Double, hypnaceous, exostome yellow or orange, endostome light yellow or hyaline, 1–4 cilia, nodulose.

Spores: Green, greenish- or yellowish-brown, globose to ovoid, minutely papillose, 10–21 μm in longest dimension.

1. Stems regularly branched, commonly bipinnate to tripinnate .... 2. *H. splendens*
1. Stems irregularly branched, sometimes bipinnate but rarely tripinnate 2
    2. Leaves small, seldom reaching 2 mm in length; branch leaves usually less than 1 mm wide .... 4. *H. umbratum*
    2. Leaves large, mostly 2 mm long; branch leaves usually more than 1 mm wide 3
        3. Stem leaves acute to short-acuminate; costae single, extending to middle of leaves .... 1. *H. pyrenaicum*
        3. Stem leaves abruptly narrowed to a long acumen; costae double, rarely reaching middle of leaves .... 3. *H. brevirostre*

1. Hylocomium pyrenaicum (Spruce) Lindb., Musci Scand. 37. 1879.

Hypnum pyrenaicum Spruce, Musci Pyren. n. 4. 1847.

PLATE 370

Plants irregularly branched or pinnately to bipinnately branched, and leaves usually more than 2 mm long with a single costa, are characters that will separate it from the other *Hylocomium* species.

Habitat: On decaying logs, humus and rocks in woods.

Maritime Distribution: Frequent. New Brunswick (Carleton, Northumberland, Queen's, Victoria, York); Nova Scotia (Halifax, Yarmouth).

Range: Labrador to Ontario, south to New York and Michigan; also in Alberta, British Columbia, Yukon Territory, Alaska, and Colorado. Europe, Asia.

Chromosome Number: n = 12.

2. **Hylocomium splendens** (Hedw.) B.S.G., Bryol. Eur. 5: 173. 487. 1852 (fasc. 49–51 Mon. 5.1).
Hypnum splendens Hedw., Spec. Musc. 262. 1801.
PLATE 371

The delicate frondose appearance of the large plants, resulting from the regularly bi- to tri-pinnate branched stems, and the stem leaves with undulate apices, separates this species from the others in the genus. The growth pattern is also distinctive and serves to distinguish it from the other *Hylocomium* species. New (annual?) growth arises from the stems to produce a frondose extension in a layered or step-like fashion.

Habitat: On humus, rotten logs, soil and rocks in forests.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Queen's, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Colchester, Cumberland, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth, St. Paul Island); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to North Carolina, Michigan, Iowa, South Dakota, Colorado, Idaho, and Oregon. *West Indies, Europe, Asia, *Africa, *Australia, *New Zealand.

Chromosome Number: n = 10, 11, 12.

Remarks: A large, easy to recognize species commonly called the "Mountain Fern Moss" or "Stair-Step Moss".

3. **Hylocomium brevirostre** (Brid.) B.S.G., Bryol. Eur. 5: 178. 493. 1852 (fasc. 49–51 Mon. 10.7).
Hypnum rutabulum var. *brevirostre* Brid., Musc. Rec. 2(2): 162. 1801.
PLATE 372

Plants somewhat similar in size and branching to *H. pyrenaicum*, but the leaves have a double costa. There is also a tendency for the stem leaves to be more abruptly acuminate and have a longer acumen than in *H. pyrenaicum*.

Habitat: On rocks, logs and humus in moist woods and near streams and springs.

Maritime Distribution: Common. New Brunswick (Albert, Victoria); Nova Scotia (Annapolis, Cape Breton, Colchester, Digby, Guysborough, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne).

Range: Newfoundland to Ontario, south to North Carolina, Tennessee, and Michigan. Mexico, *Central America, Europe, *Asia, *Africa.

Chromosome Number: n = 11.

4. **Hylocomium umbratum** (Hedw.) B.S.G., Bryol. Eur. 5: 175. 488. 1852 (fasc. 49–51 Mon. 6.2).
Hypnum umbratum Hedw., Spec. Musc. 263. 1801.
PLATE 373

Differing from *H. brevirostre*, which also has pinnately or binnately branched stems and double costae, by its small leaves that are mostly 1 mm long or rarely up to 2 mm.

Habitat: On rotten wood and humus over rocks in forests.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Gloucester, Kent, Madawaska, Northumberland, Queen's, Restigouche, Sunbury, Victoria); Nova Scotia (Colchester, Cumberland, Guysborough, Halifax, Inverness, Kings, Pictou, Victoria); Prince Edward Island (Queens).

Range: Labrador to Ontario, south to North Carolina, Tennessee, and Michigan; also in Alaska and British Columbia. Europe, Asia.

Chromosome Number: n = 7.

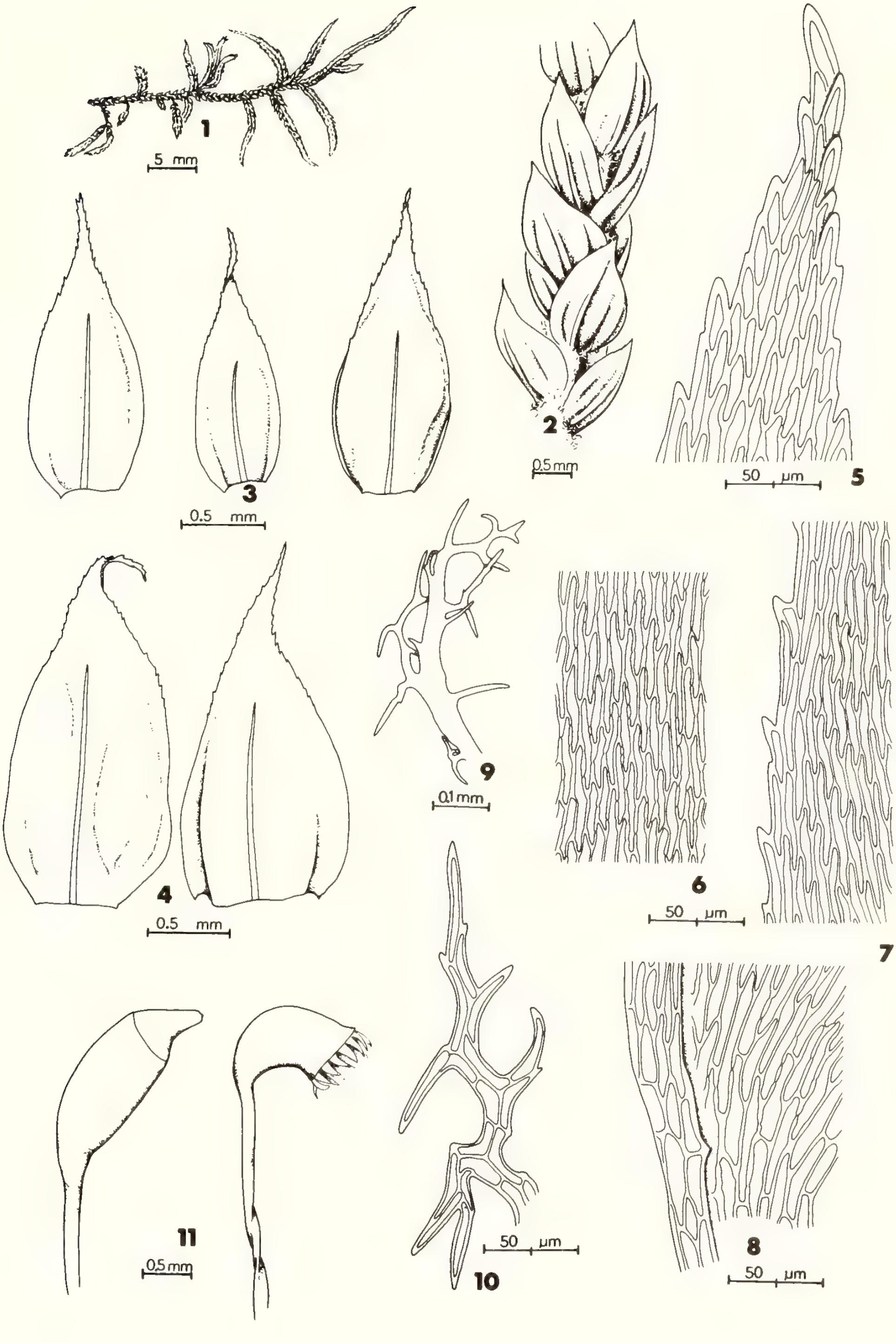
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Plate 370. *Hylocomium pyrenaicum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of branch leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9–10. Paraphyllia. 11. Capsules, operculate (wet), inoperculate (dry).

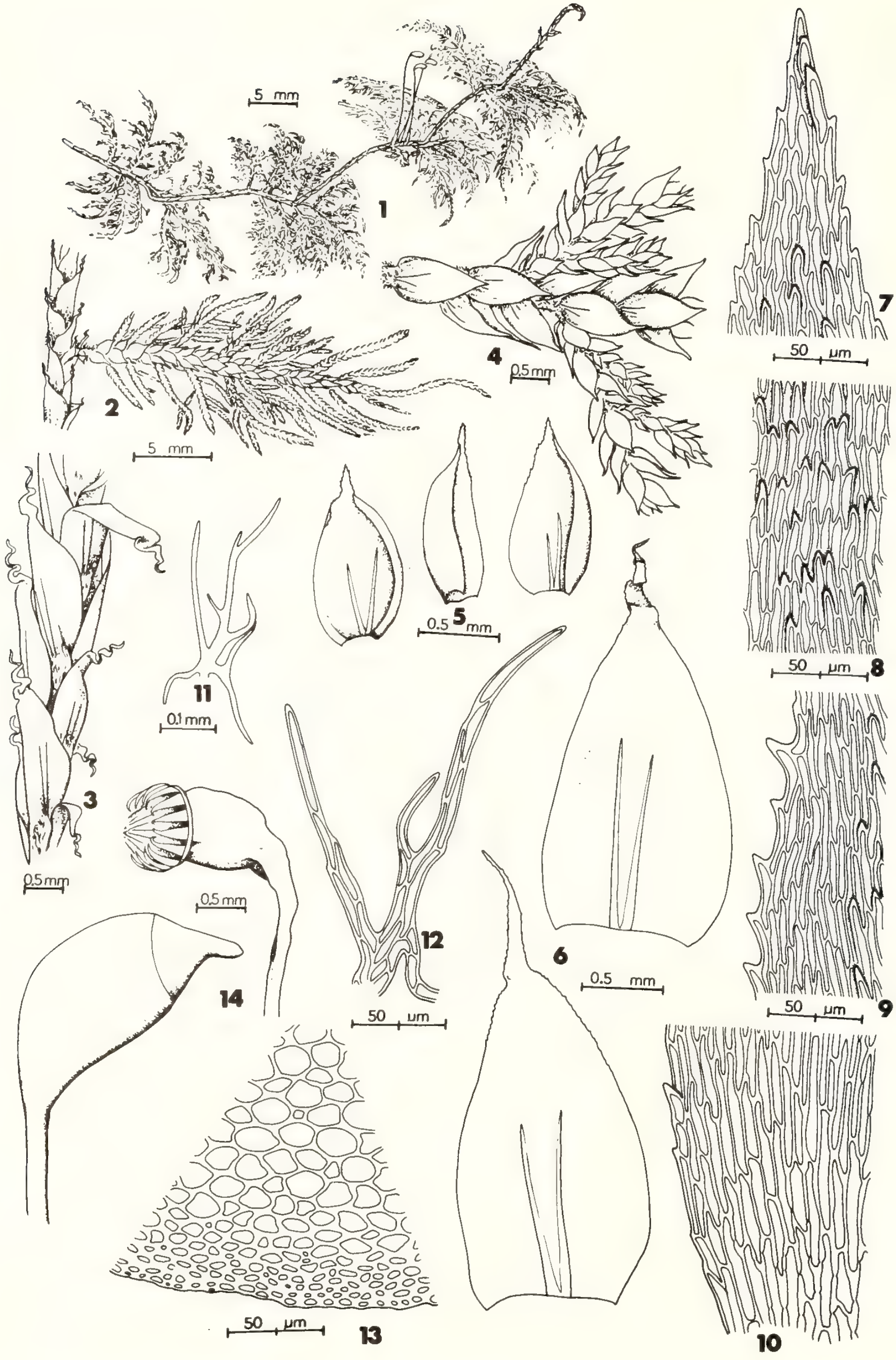
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Plate 371. *Hylocomium splendens*. 1. Habit. 2. Portion of stem and branch. 3. Portion of stem. 4. Portion of branch. 5. Branch leaves. 6. Stem leaves. 7–10. Cells of branch leaf (7, apical. 8, median. 9, median-marginal. 10, alar.). 11–12. Paraphyllia. 13. Cross-section of portion of stem. 14. Capsules, operculate (wet), inoperculate (dry).

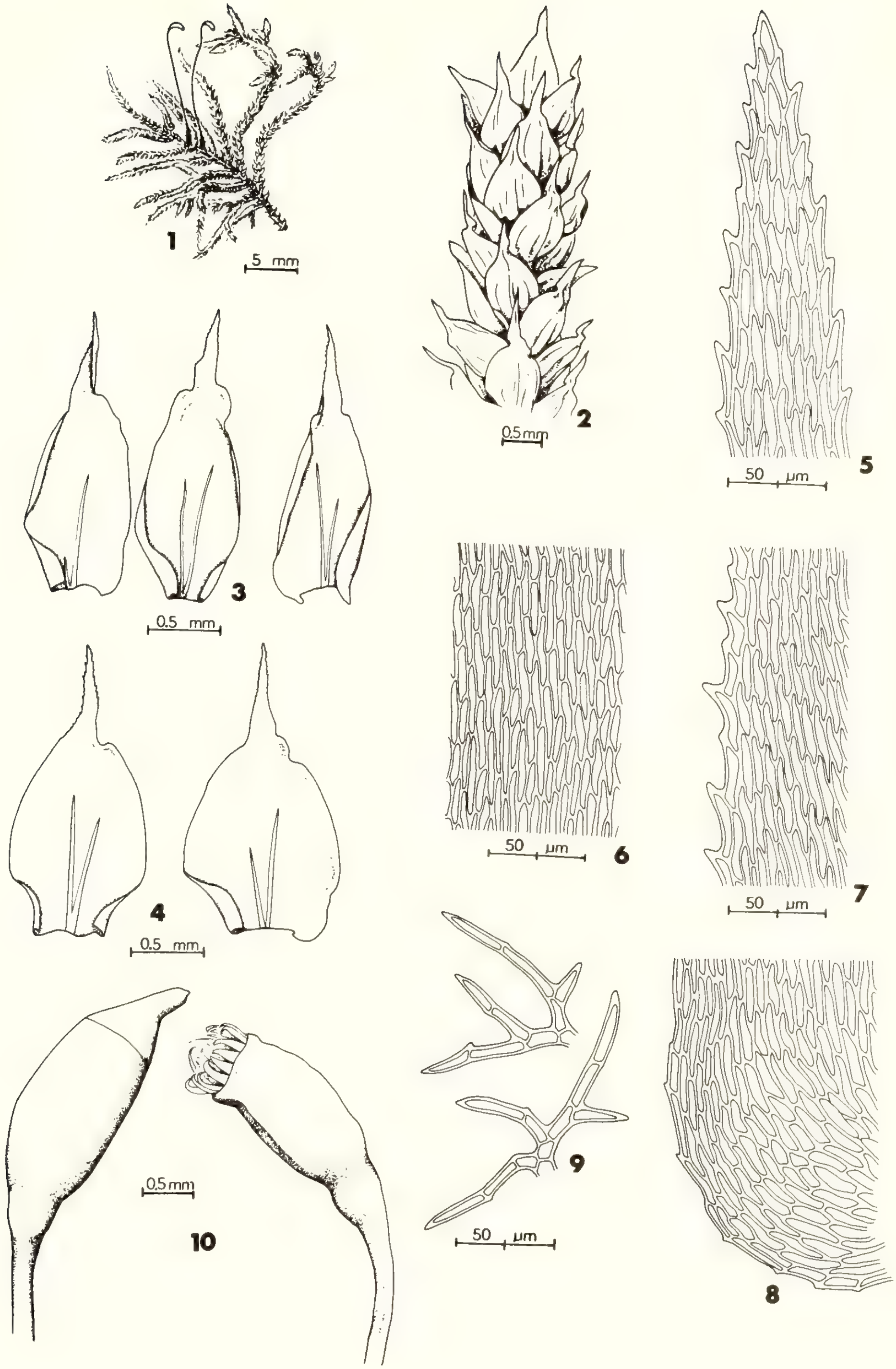
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Plate 372. *Hylocomium brevirostre*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of branch leaf (5, apical. 6, median. 7, median-marginal. 8, alar.) 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

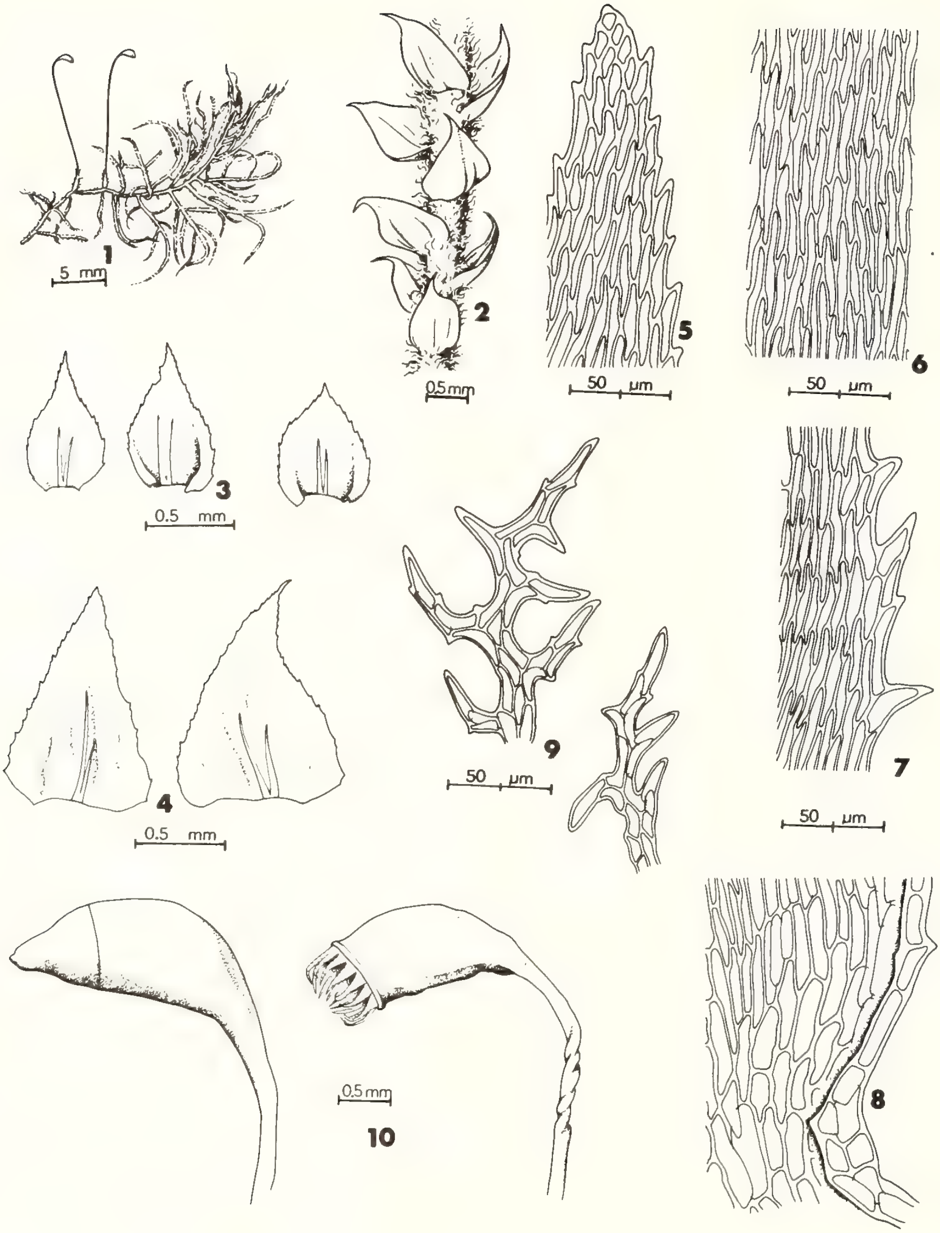
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Plate 373. *Hylocomium umbratum*. 1. Habit. 2. Portion of stem. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of branch leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

Family CLIMACIACEAE

Climacium Web. & Mohr *ex* Mohr, Naturh. Reise Schwed. 96. 1804.

Habit: Creeping, with erect, dendroid branches.

Colour: Dark green to yellowish green, brown below, glossy.

Stems: Primary stems creeping, branches erect, 3–10 cm high, dendroid, rhizoids on primary stems and lower part of secondary stems. Paraphyllia on stems and branches, uniseriate, filiform, simple or branched.

Leaves: Stem leaves clasping stem, ovate, obtuse or apiculate to acuminate, branch leaves erect to erect-spreading, little changed when dry, concave to weakly keeled, plicate, unistratose, oblong or ovate to oblong- to ovate-lanceolate, sometimes subcordate, broadly acute to acuminate, shortly decurrent, often auriculate at base. Perichaetial leaves membraneous, clasping base of seta, weakly costate, oblong- to ovate-lanceolate, acuminate.

Leaf Margins: Plane or broadly recurved at apex, coarsely toothed above, serrate to serrulate below.

Costae: Single, subpercurrent, prominent on dorsal surface.

Leaf Cells: Smooth, the walls of medium thickness, basal cells pitted. Median cells rhomboidal to fusiform, becoming larger at base, often enlarged in alar region.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Cucullate, naked, yellowish with a reddish tip, fugacious.

Capsules: Solitary or clustered, on a seta arising from secondary stem below apex, brown to reddish brown, cylindric, straight, erect, smooth, wrinkled at neck when dry.

Setae: Straight to flexuose, smooth, twisted when dry, brown to reddish brown.

Annuli: Lacking.

Opercula: High-conic to short-rostrate, straight to slightly arcuate.

Peristomes: Double, 16 exostome teeth, lanceolate, reddish brown, endostome segments linear, somewhat longer than exostome, orange, cilia lacking.

Spores: Yellow to yellowish brown, globose, minutely papillose, 12–22 μm.

Climacium, which rarely produces sporophytes, is commonly known as the "Tree Moss" because of its dendroid branching.

1. Median cells of branch leaves often more than 6:1; stem leaves abruptly apiculate; plants common . . . . 1. *C. dendroides*
1. Median cells of branch leaves usually 3-5:1, seldom reaching 7:1; stem leaves gradually acuminate; plants rare . . . . 2. *C. americanum*

1. Climacium dendroides (Hedw.) Web. & Mohr, Naturh. Reise Schwed. 96. 1804.

Leskea dendroides Hedw., Spec. Musc. 228. 1801.

PLATE 374

Plants with creeping primary stems which give rise to erect, dendroid branches covered with filiform, simple or branched paraphyllia, stem leaves obtuse, apiculate, branch leaves ovate or oblong- to ovate-lanceolate, margins coarsely toothed above, median cells 5–10:1, and costae single, subpercurrent.

Habitat: On wet soil in swampy places, on humus in woods and on shady, damp rocks.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Kent, King's, Madawaska, Restigouche, Victoria, Westmorland, York); Nova Scotia (Cape Breton, Colchester, Guysborough, Hants, Inverness, Kings, Lunenburg, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to Virginia, Illinois, Minnesota, *New Mexico, Arizona, and *California. Europe, Asia, *New Zealand.

Chromosome Number: n = 11.

2. **Climacium americanum** Brid., Spec. Musc. 2: 45. 1812.

[Synonym: *C. kindbergii* (Ren. & Card.) Grout]

PLATE 375

Similar to *C. dendroides* but differing primarily in the shorter median cells (3–5(7):1) of the branch leaves and the gradually acuminate apices of the stem leaves. When found with sporophytes, which is rare, the capsules are twice as long (4–6 mm) as *C. dendroides* (2–3 mm).

Habitat: On soil beside river.

Maritime Distribution: Rare. Nova Scotia (Annapolis). Collected in Kejimkujik National Park, Mill Falls, Mersey River, ca. 44°29′N, 65°08′W, 3 August 1968 (*Ireland 12534*).

Range: *Newfoundland to Ontario, south to Florida, Louisiana, and Oklahoma; disjunct to Alaska and *British Columbia. *Asia.

Chromosome Number: n = 11.

Remarks: *Climacium americanum* is sometimes distinguished from *C. dendroides* in various manuals on the basis of the more prominent auricles at the base of its branch leaves but I found this character of no value in separating the Maritime plants. In fact, the plants of the one known Maritime collection of *C. americanum* have no auricles or indistinct ones while the leaves of *C. dendroides* often have prominent auricles. Horton and Vitt (1976), who studied the morphology and distribution of both species in North America, also found this to be true of plants in the northeastern United States.

Plants that are sparsely and irregularly branched, with a prostrate habit have been referred to as *C. kindbergii* (Ren. & Card.) Grout which is considered an environmental form of *C. americanum*.

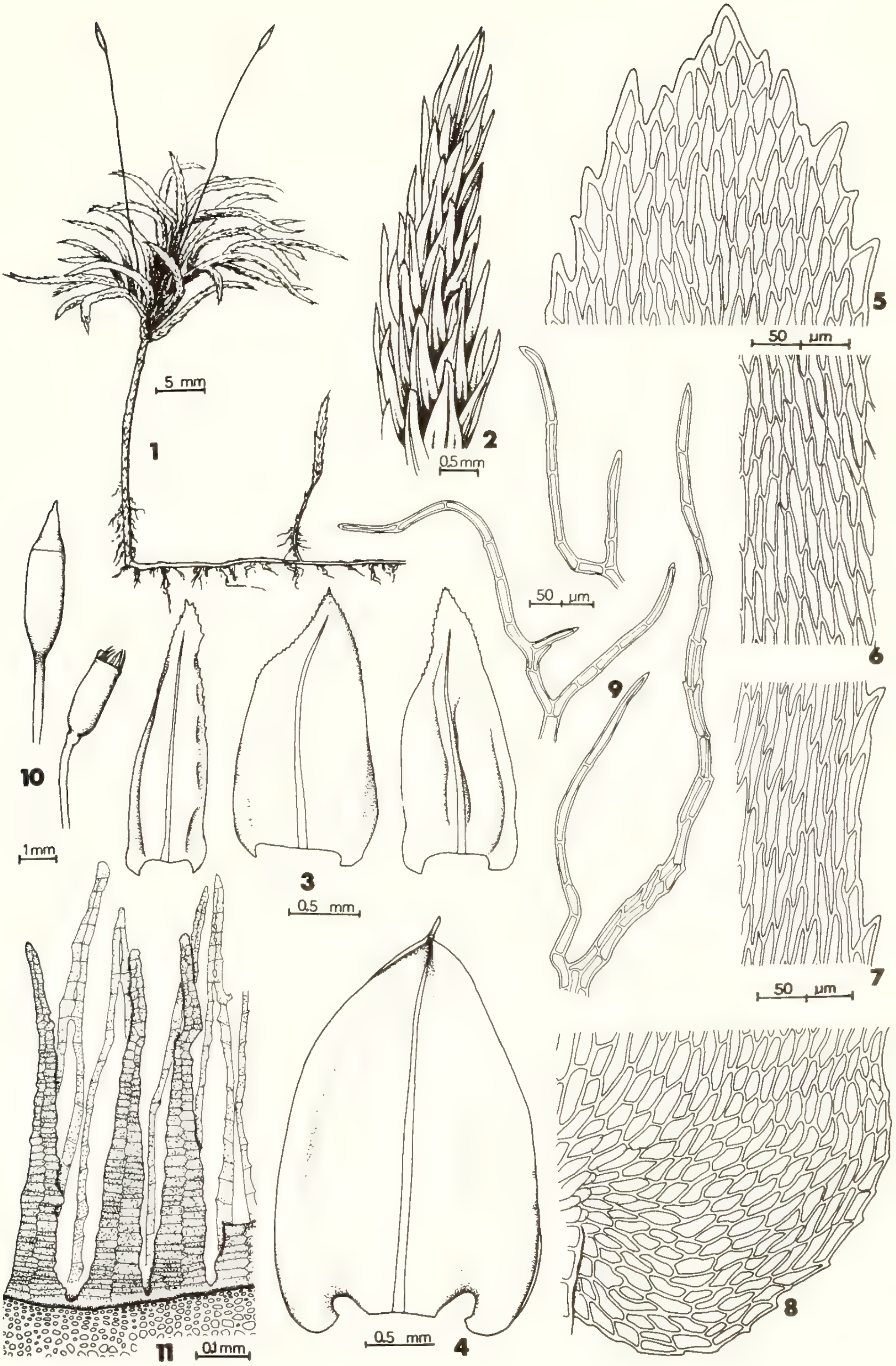
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Plate 374. *Climacium dendroides.* 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaf. 5–8. Cells of branch leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry). 11. Peristome teeth.

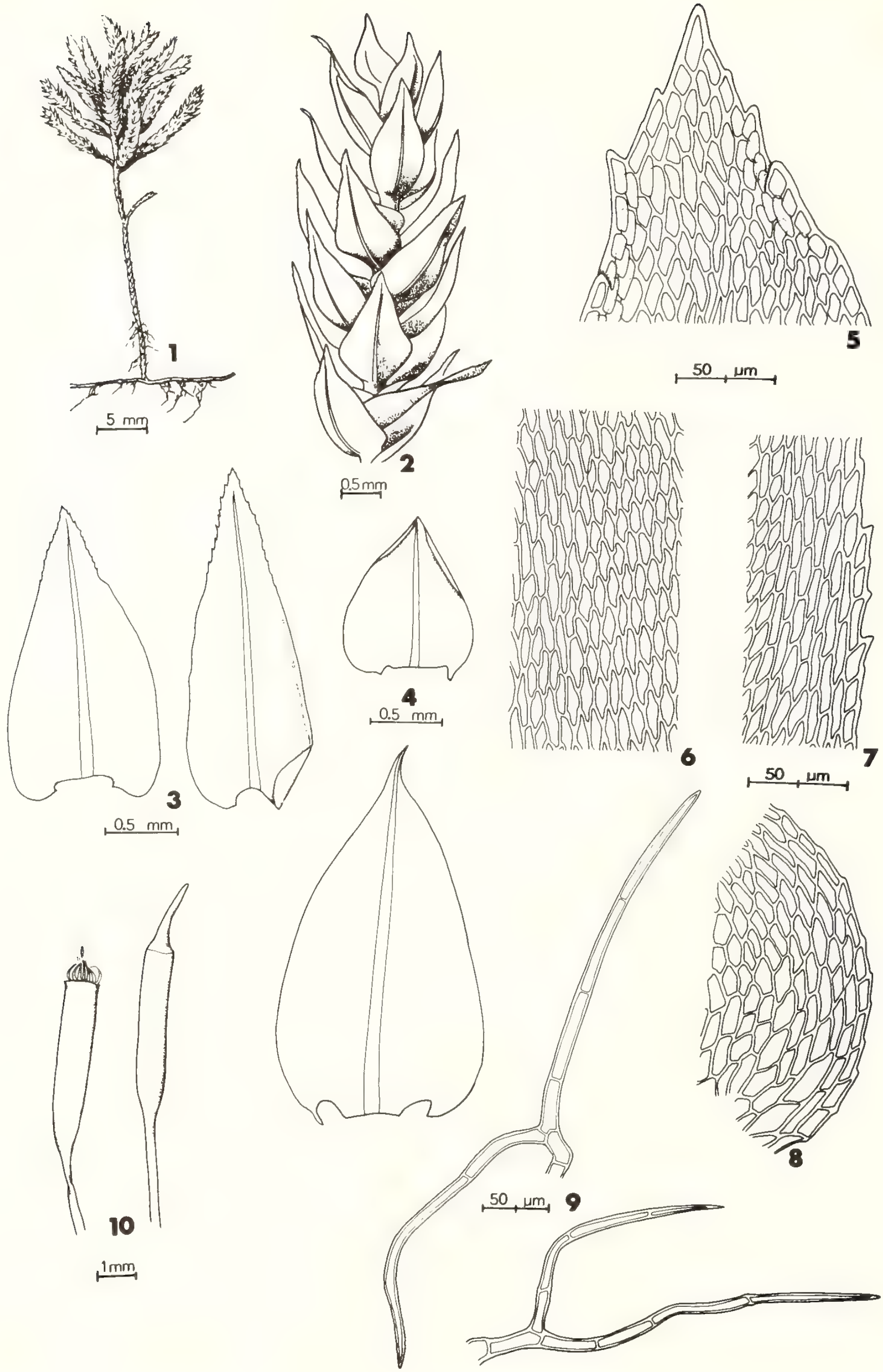
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Plate 375. *Climacium americanum*. 1. Habit. 2. Portion of branch. 3. Branch leaves. 4. Stem leaves. 5–8. Cells of branch leaf (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Paraphyllia. 10. Capsules, operculate (wet), inoperculate (dry).

Family BUXBAUMIACEAE

Buxbaumia Hedw., Spec. Musc. 166. 1801.

Habit: Erect, scattered or gregarious.

Colour: Plants arising from a green to brownish protonematal mat.

Stems: 0.2–0.5 mm high, erect, simple, rhizoids at base, papillose, white or reddish.

Leaves: Erect, ovate to ovate-lanceolate, small, inconspicuous, nondecurrent. Perichaetial leaves not differentiated.

Leaf Margins: Plane, ciliate.

Costae: Lacking.

Leaf Cells: Smooth, the walls of medium thickness, nonpitted. Median cells rectangular to oblong-hexagonal, scarcely differing throughout.

Asexual Reproductive Bodies: Lacking.

Sex: Reported to be dioicous. Male plants not seen.

Calyptrae: Reported to be conic, minute, covering 1/2 of operculum, fugacious.

Capsules: Solitary, on a seta arising from stem apex, chestnut-brown or yellowish brown, ovoid and dorsally flattened when dry, or cylindric, inclined to horizontal, smooth, sometimes with a rim between the upper and lower surfaces, epidermis often rolling back from mouth, contracted to a short, swollen mouth.

Setae: Straight or weakly arcuate, warty, not twisted, reddish to chestnut-brown.

Annuli: Lacking.

Opercula: Conic, blunt, straight.

Peristomes: Double, exostome consisting of a series of smooth or papillose teeth, pale brown, increasing in size toward endostome, the endostome forming a truncated cone, whitish.

Spores: Yellow to yellowish brown, globose, smooth to minutely papillose, 7–10 μm.

1. Capsules clearly longer than broad, cylindric and not flattened dorsally .... 1. *B. minakatae*
1. Capsules nearly as broad as long, dorsally flattened, especially when dry .... 2. *B. aphylla*

1. Buxbaumia minakatae Okam., Bot. Mag. Tokyo 25: 30. 1911.
[Synonym: *B. subcylindrica* Grout]
PLATE 376

A bizarre plant that bears little resemblance to other mosses. The plant consists primarily of a large, cylindric, yellowish brown capsule, elevated on a long, warty seta which arises from a protonematal mass. The leaves are rudimentary and inconspicuous and only a careful inspection around the base of the seta will reveal a few minute ones.

Habitat: Rotten wood in wooded ravines.

Maritime Distribution: Rare. Nova Scotia (Victoria). Collected on Cape Breton Island, Mary Ann Falls, 47°22′N, 67°38′W, 7 September 1967 (*Ireland 10638*) and in the valley of Barrasois River, July-August 1914 (as *B. indusiata, Nichols 1A* NY).

Range: Known from Newfoundland, Nova Scotia, Ontario, *British Columbia (?), *New York, *Massachusetts, *Vermont, *Michigan, *Virginia and *North Carolina. *Asia.

Chromosome Number: Unreported.

Remarks: Known as the "Bug-on-a-Stick Moss" or "Hump-Backed Elves" because of the odd capsules that one could mistake for a fungus. Not recognized without sporophytes because of the small size of the gametophytes.

2. Buxbaumia aphylla Hedw., Spec. Musc. 166. 1801.
PLATE 376

Differing from *B. minakatae* in the ovoid, dorsally flattened, chestnut-brown capsule.

Habitat: On humus in woods, soil under shrubs, among crevices of rock outcrops and rotten wood.

Maritime Distribution: Frequent. New Brunswick (Charlotte, King's); Nova Scotia (Annapolis, Halifax, Inverness, Kings, Pictou, Victoria); Prince Edward Island (Kings, Queens).

Range: *Greenland to Yukon Territory, south to Maryland, southern Quebec and Michigan; also in Washington and *Colorado. Europe, Asia, *Australia.

Chromosome Number: n = 8.

Remarks: Crum (1976) reports the moss to be a pioneer of burned-over areas in Michigan.

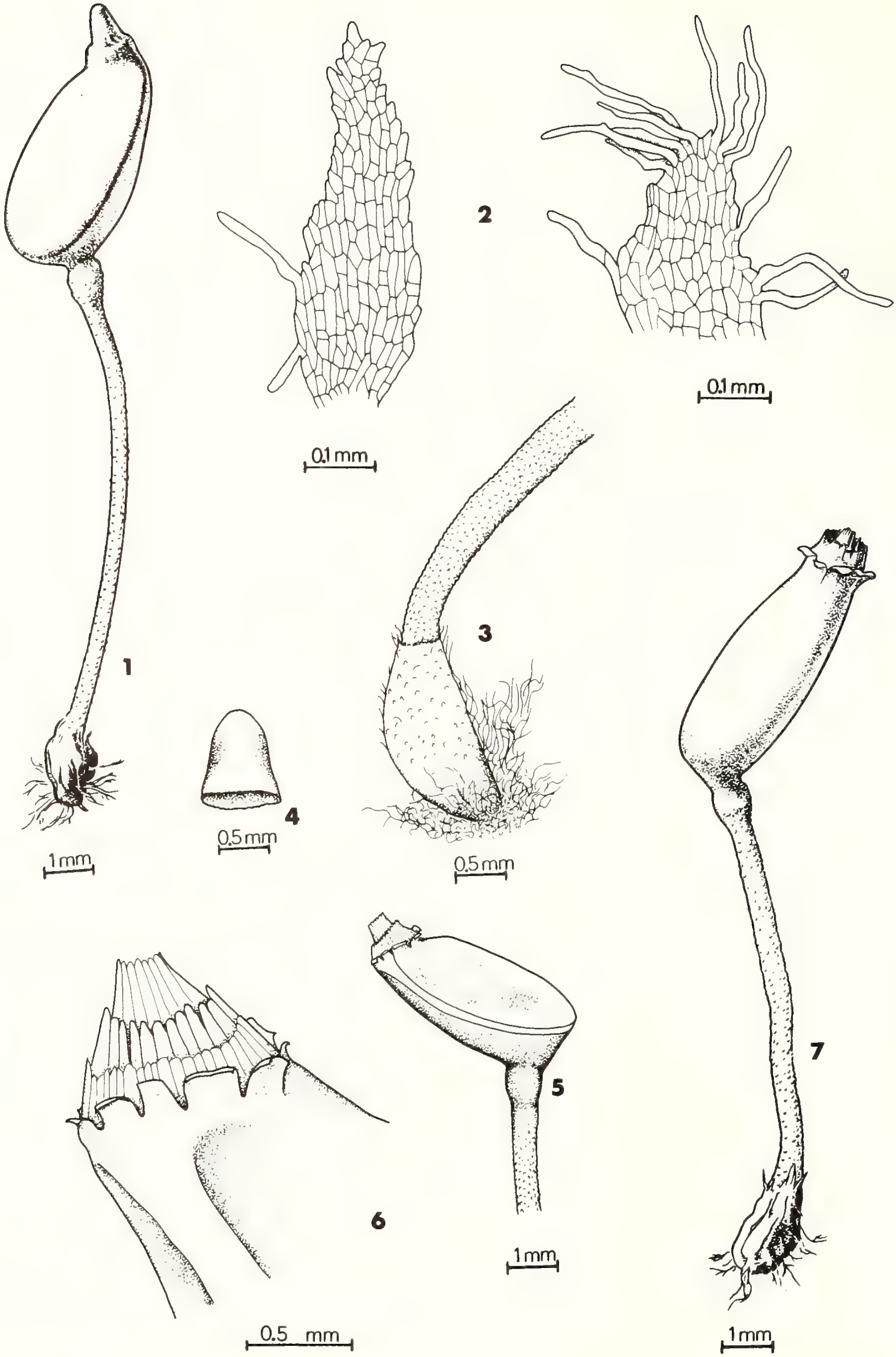
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Plate 376. *Buxbaumia aphylla*. 1. Habit. 2. Leaves. 3. Base of seta. 4. Operculum. 5. Capsule (wet). 6. Peristome. *Buxbaumia minakatae*. 7. Habit.

Family DIPHYSCIACEAE

Diphyscium Mohr, Obs. Bot. 34. 1803, & Mohr, Ind. Musc. Pl. Crypt. 3. 1803.

Habit: Erect, in extensive, dense tufts.

Colour: Dark green, becoming brown or black with maturity.

Stems: 1–2 mm high, erect, simple, rhizoids at base, papillose, often white.

Leaves: Erect-spreading, straight, contorted when dry, leaves of sterile plants, male plants and lower leaves of fertile plants short, concave, lamina 2–3 stratose, lingulate, obtuse, nondecurrent. Perichaetial leaves long, nearly flat, scarious, lanceolate to ovate-lanceolate, long-awned, the awn spinulose or sometimes nearly smooth, fringed at apex below awn.

Leaf Margins: Plane, crenulate nearly to base.

Costae: Single, ending below apex on sterile plants, male plants and lower leaves of fertile plants, long-excurrent and forming a spinulose or sometimes nearly smooth awn on perichaetial and upper leaves of fertile plants.

Leaf Cells: Bulging and papillose, 1-several papillae per cell, basal cells smooth, thick-walled, nonpitted. Median cells quadrate, hexagonal, rectangular or rounded, becoming long and rectangular near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous.

Calyptrae: Conic, naked, yellowish, scarcely covering operculum.

Capsules: Solitary, on a short seta arising from stem apices, greenish yellow, becoming brown at maturity, obliquely ovoid-conic, erect, smooth, narrowed at mouth, gibbous.

Setae: Short, straight, smooth, greenish yellow.

Annuli: 1–2 rows of small cells, persistent or deciduous.

Opercula: Conic, slightly arcuate.

Peristomes: Double, but appearing single, exostome of 16, short, triangular teeth, endostome whitish, of 16, long, papillose filaments forming a cone.

Spores: Yellow to yellowish brown, globose to ovoid, minutely papillose, 7–12 μm in longest dimension.

1. **Diphyscium foliosum** (Hedw.) Mohr, Ind. Musc. Pl. Crypt. 3. 1803.
Buxbaumia foliosa Hedw., Spec. Musc. 166. 1801.
[Synonym: *Webera sessilis* Lindb.]
PLATE 377

One of the most distinctive mosses in the Maritimes because of the large, 2–3 mm long, asymmetric capsules that are nearly sessile, arising from a basal cluster of leaves, the upper leaves with an excurrent, spinulose or sometimes nearly smooth costa and a fringed apex. Sterile plants and male plants have lingulate leaves with obtuse apices and they often occur in extensive patches.

Habitat: On clay banks in woods and soil over rocks, often near creeks.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent); Nova Scotia (Annapolis, Cape Breton, Colchester, Digby, Halifax, Hants, Inverness, Kings, Pictou, Shelburne, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Newfoundland to Ontario, south to North Carolina, Tennessee, and Arkansas; also in British Columbia. Mexico, *Central America, West Indies, Europe, Asia, Africa.

Chromosome Number: n = 8, 9.

Remarks: Commonly known as the "Grain of Wheat Moss".

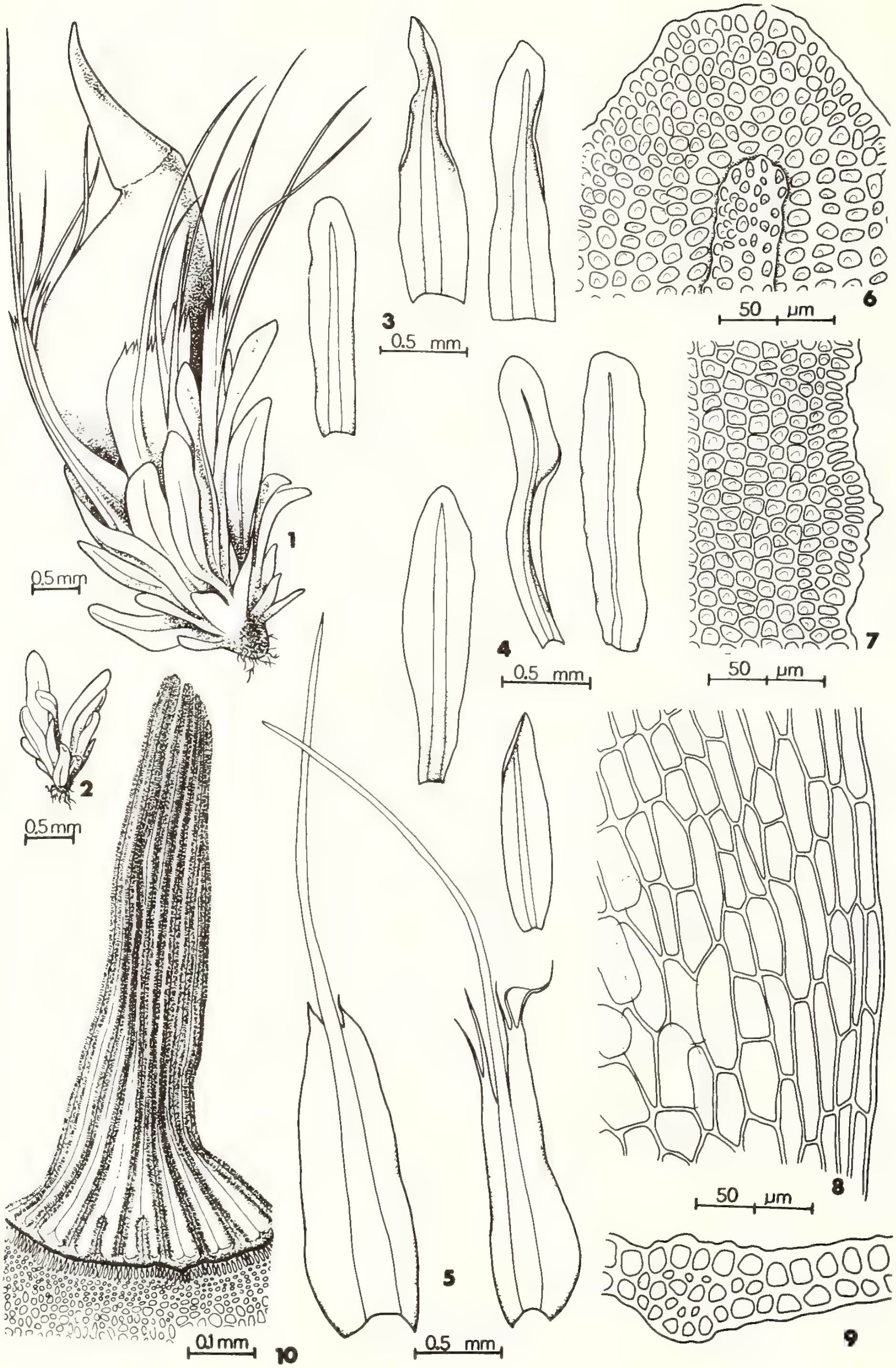
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Plate 377. *Diphyscium foliosum*. 1. Habit. 2. Male plant. 3. Leaves of female plant. 4. Leaves of male plant. 5. Perichaetial leaves. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of portion of leaf near middle. 10. Peristome.

Family TETRAPHIDACEAE

1. Stems long and conspicuous; protonematal leaves lacking; gemmae cups common; calyptrae covering about $1/2$ of capsule . . . . 1. *Tetraphis* (p. 659)
1. Stems short and inconspicuous; protonematal leaves present, linear-clavate; gemmae cups lacking; calyptrae covering most of capsule . . . . 2. *Tetradontium* (p. 663)

1. **Tetraphis** Hedw., Spec. Musc. 45. 1801.
[Synonym: *Georgia* Ehrh. *ex* C. Müll.]

Habit: Plants gregarious, usually in dense colonies.

Colour: Green to yellowish green above, brown to reddish brown below, sometimes entirely reddish brown with age, dull.

Stems: 1 cm or less high, rarely up to 2 or 3 cm, erect, simple or occasionally branched, rhizoids at base, strongly papillose.

Leaves: Keeled to almost flat, somewhat contorted when dry, lamina unistratose, lower leaves ovate to ovate-lanceolate, upper leaves longer and narrower, linear, acute to somewhat acuminate, not or shortly decurrent.

Leaf Margins: Entire to crenulate, broadly reflexed.

Costae: Single, strong, ending several cells below apex.

Leaf Cells: Smooth, walls thick, nonpitted, irregularly rounded throughout most of leaf, becoming elongate toward base adjacent to costa.

Asexual Reproductive Bodies: Multicellular, lenticular bodies with smooth cells, produced on short stalks attached to the bottom of a cup-shaped receptacle (gemmae cup) formed by a rosette of rounded leaves at the tip of a sterile stem.

Sex: Autoicous. Stems with antheridia and stems with archegonia appearing intermixed in the rhizoid mat at the base of the plant.

Calyptrae: Mitrate, plicate, naked, white with brown tip, covering $1/3$–$1/2$ of capsule.

Capsules: Solitary, on a seta arising from stem apex, brown to reddish brown, darker around mouth, cylindric, straight to slightly arcuate, erect, finely striate, somewhat shrunken under mouth when dry.

Setae: Straight to flexuose and smooth or abruptly bent midway with papillae above the bend, twisted when dry.

Annuli: Lacking.

Opercula: Conic, straight.

Peristomes: Single, consisting of 4, narrowly triangular, solid, unsegmented teeth, constructed of several layers of elongated cells.

Spores: Green to yellowish green, globose, papillose, 10–17 μm.

1. Setae straight or somewhat bent, smooth . . . . 1. *T. pellucida*
1. Setae sharply bent in the middle, strongly papillose above bend . . . . 2. *T. geniculata*

1. Tetraphis pellucida Hedw., Spec. Musc. 45. 1801.
[Synonym: *Georgia pellucida* Rabenh.]
PLATE 378

Stems usually 1 cm high, leaves ovate to ovate-lanceolate, 0.5–3.0 mm long, margins broadly recurved, costa subpercurrent, sterile plants with a terminal rosette of differentiated leaves forming cup-shaped receptacles (gemmae cups) containing multicellular, lenticular gemmae; capsules erect, cylindric, setae straight, smooth, peristome teeth 4, unsegmented.

Habitat: Usually on rotten wood (primarily coniferous) such as logs, tree trunks and stumps, sometimes on woody humus, rarely on porous rock, usually sandstone.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, King's, Madawaska, Restigouche, Saint John, Victoria, Westmorland, York); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Shelburne, Victoria, Yarmouth); Prince Edward Island (Kings, Prince, Queens).

Range: Widespread across the continent, from Labrador to Alaska, south to California, *Arizona, Colorado, South Dakota, Arkansas, Tennessee, and South Carolina. Europe, Asia.

Chromosome Number: n = 7, 8.

Remarks: Although the gemmae cups may appear to some to be a splash-cup device, whereby rain drops falling into the cups disperse the gemmae, I agree with Brodie (1951) who states "Examination of the gemma-bearing cups of *Tetraphis* does not convince one that they are actually efficient in splashing, partly because of their small size and partly because of the rather delicate character of the plants which are easily battered about by raindrops." However, it also seems quite likely that because of their delicate nature even a near miss would be enough to shake the cup to disperse the gemmae.

2. **Tetraphis geniculata** Girg. *ex* Milde, Bot. Zeit. 23: 155. 1865.
PLATE 379

Similar to *T. pellucida* when sterile except for the somewhat longer leaves. When fertile, the abruptly bent, papillose setae will separate the two.

Habitat: Often on rotten wood (mainly coniferous) such as logs, tree trunks and stumps, rarely on peat and sandstone ledges.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Kent, Saint John); Nova Scotia (Cumberland, Inverness, Kings, Lunenburg, Queens, Victoria, Yarmouth); Prince Edward Island (Queens).

Range: Predominantly maritime and usually not occurring very far inland, in the West from Alaska, south to Washington; in the East from Labrador, south to New Hampshire. Also known in the western United States from northern Idaho which is its furthest known inland station. Asia.

Chromosome Number: Unreported.

Remarks: Lawton (1971) states that asexual reproduction is apparently wanting but I do not find this to be true. Gemmae cups are present in colonies of *T. geniculata* throughout its range but they are often smaller and less frequently produced than in *T. pellucida*.

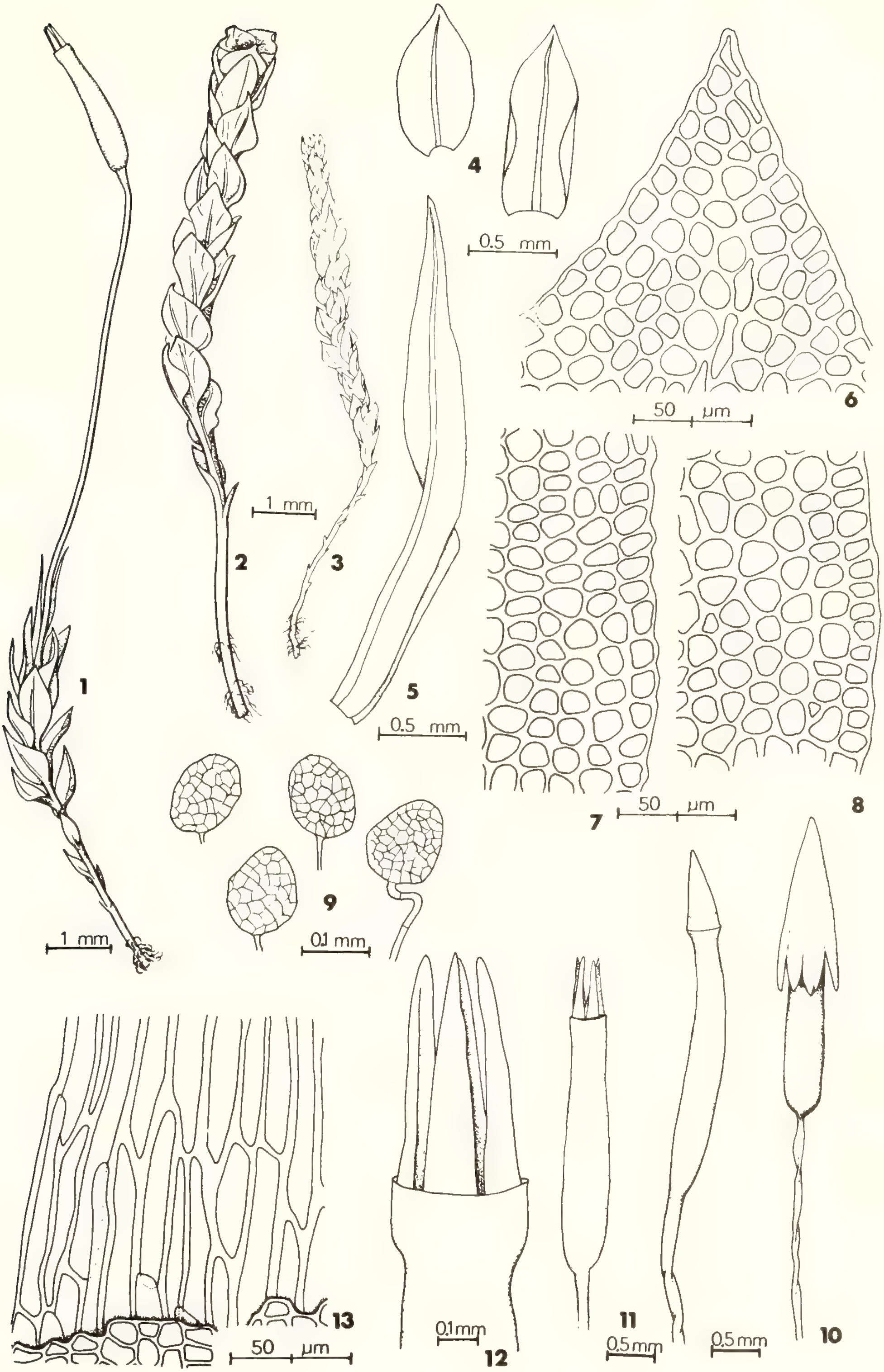
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Plate 378. *Tetraphis pellucida*. 1. Habit. 2. Gemmiferous plant. 3. Male plant. 4. Leaves. 5. Perichaetial leaf. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Gemmae. 10. Calyptrate capsule. 11. Capsules (dry). 12. Peristome. 13. Lower portion of peristome tooth.

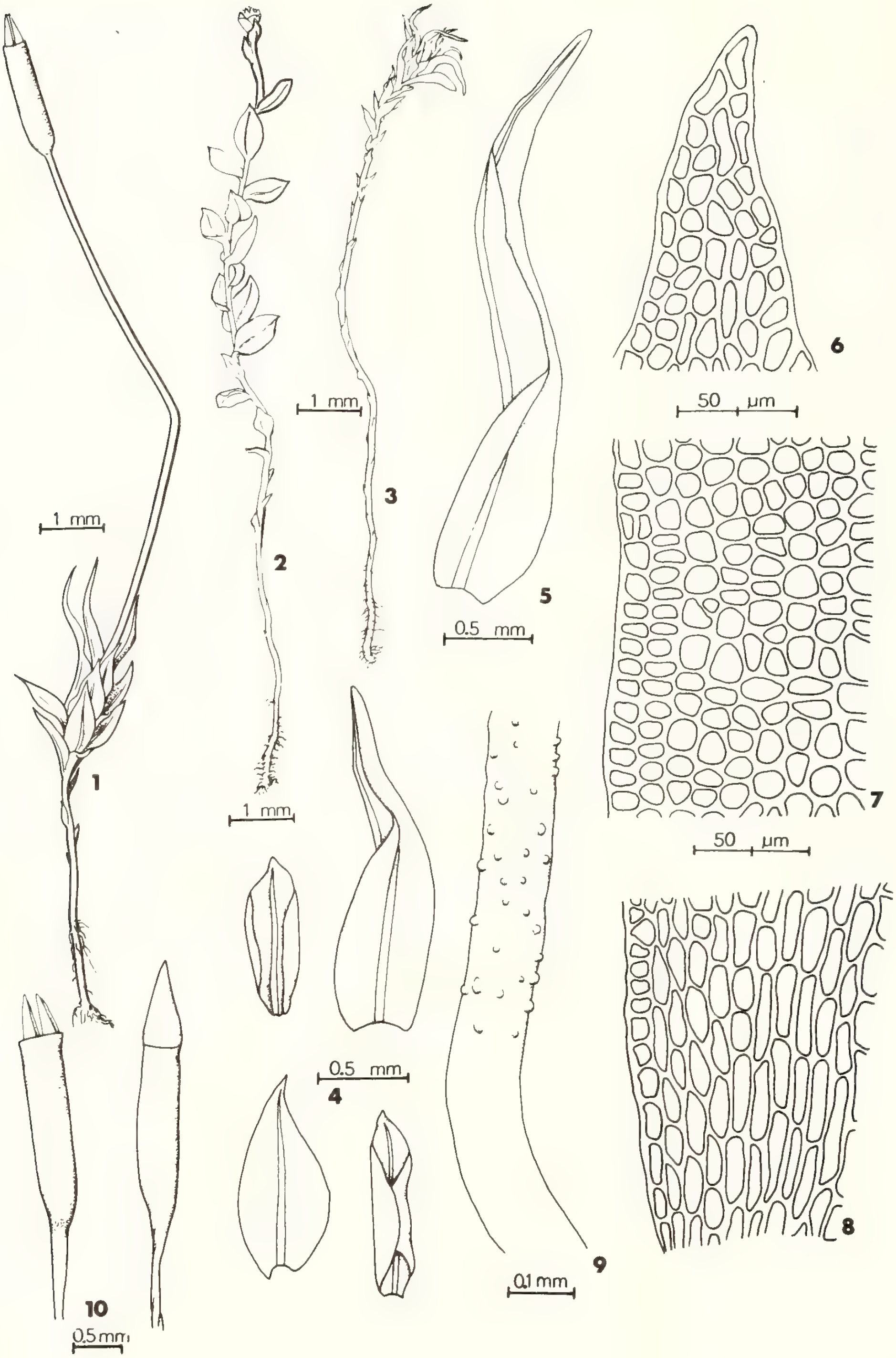
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Plate 379. *Tetraphis geniculata*. 1. Habit. 2. Gemmiferous plant. 3. Male plant. 4. Leaves. 5. Perichaetial leaf. 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Portion of seta showing papillae. 10. Capsules (dry).

2. **Tetradontium** Schwaegr., Spec. Musc. Suppl. 2(1): 102. 1824.

Habit: Plants scattered or gregarious, often growing in an inverted position.
Colour: Green to brownish green, dull.
Stems: Extremely short and almost lacking, less than 0.5 mm high, erect, simple, rhizoids at base, papillose.
Leaves: Protonematal leaves erect-spreading, flat, lamina multistratose, of 2–3 layers of cells, linear-clavate, acute, nondecurrent. Perichaetial and perigonial leaves concave, ovate to ovate-lanceolate.
Leaf Margins: Protonematal leaves plane, entire or sometimes crenulate at apex, unistratose.
Costae: Lacking in protonematal leaves, single and faint in perichaetial and perigonial leaves, seldom reaching leaf middle.
Leaf Cells: Protonematal leaf cells smooth, walls thick, nonpitted, square to rectangular.
Asexual Reproductive Bodies: Lacking.
Sex: Apparently autoicous with perichaetial and perigonial buds intermingled on same protonema.
Calyptrae: Mitrate, plicate, naked, yellowish with brown tip, covering $^1/_2$–$^2/_3$ of capsule.
Capsules: Solitary, on a seta arising from perichaetial leaves, brown to reddish brown, cylindric, straight, erect, smooth, not or scarcely shrunken under mouth when dry.
Setae: Straight, smooth, sometimes with a few twists when dry.
Annuli: Lacking.
Opercula: Conic, straight.
Peristomes: Single, consisting of 4, broadly triangular, solid, unsegmented teeth, constructed of several layers of elongated cells.
Spores: Green to yellowish green, globose, smooth to minutely papillose, 10–17 μm.

1. **Tetradontium brownianum** (Dicks.) Schwaegr., Spec. Musc. Suppl. 2(1): 102. 1824.
Bryum brownianum Dicks., Pl. Crypt. Brit. fasc. 4: 7. 1801.
[Synonyms: *Tetraphis browniana* (Dicks.) *Grev.; Georgia browniana* (Dicks.) C.Müll.]
PLATE 380

Plants erect, minute, less than 7 mm high, often growing inverted, protonematal leaves present around sporophytes, ecostate, flat, linear-clavate, short, up to 2 mm long, the sporophyte with an erect, cylindric capsule with 4 solid peristome teeth.

Habitat: On the undersurface of moist granite ledges, rarely on the side of sandstone boulders, along streams and beside waterfalls.

Maritime Distribution: Rare. New Brunswick (Albert); Nova Scotia (Victoria); Prince Edward Island (Kings).

Range: In northern Alaska, western British Columbia and Washington, Upper Peninsula of Michigan, Ontario, Gaspé Peninsula of Quebec, southern Newfoundland and south to northern *Maine, New Hampshire, and *New York. Europe, Asia.

Chromosome Number: n = 8.

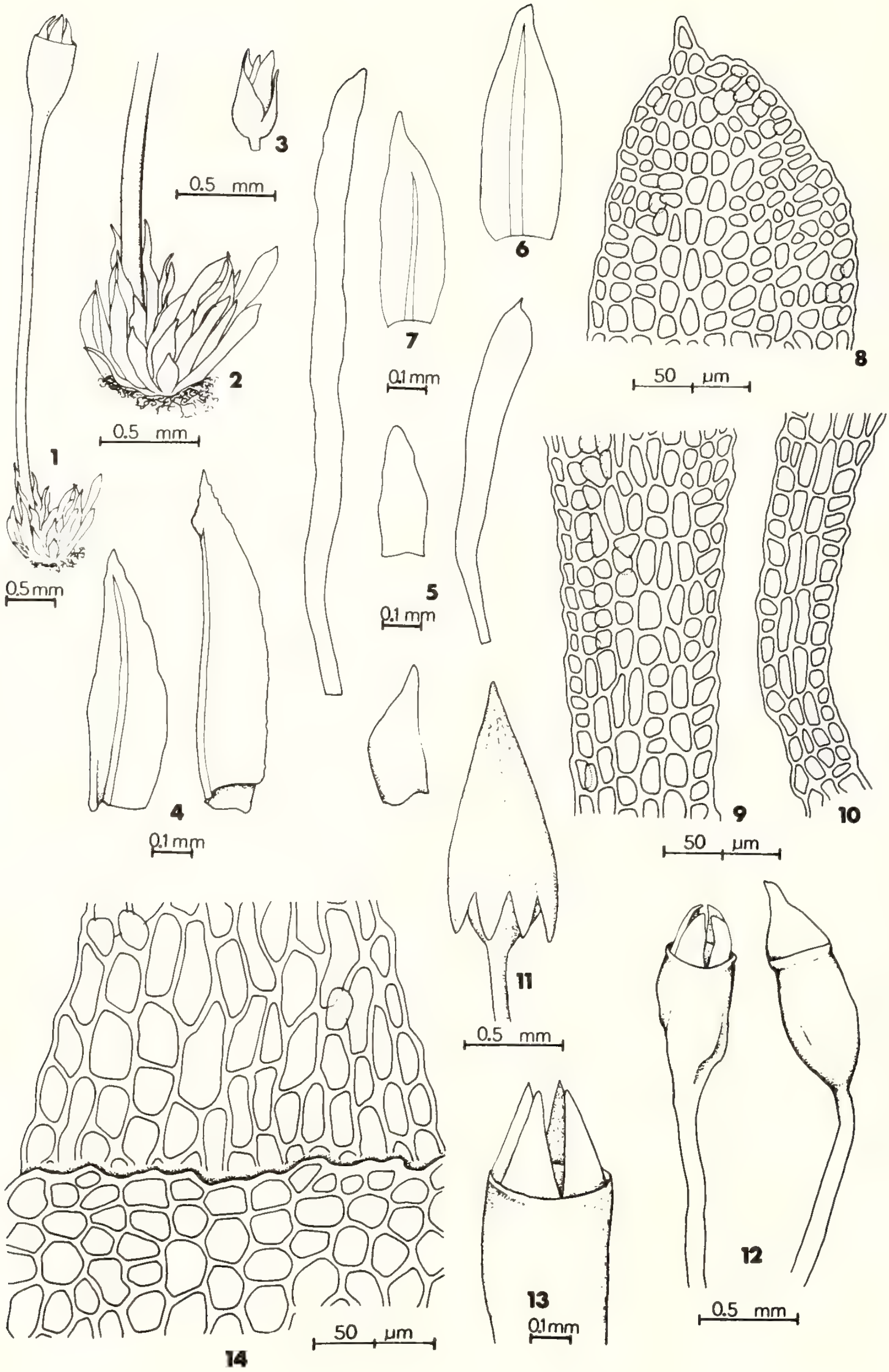
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Plate 380. *Tetradontium brownianum*. 1-2. Habit. 3. Perigonial bud. 4. Perichaetial leaves. 5. Protonematal leaves. 6-7. Perigonial leaves. 8-10. Cells of protonematal leaf (8, apical. 9, median. 10, basal.). 11. Calyptrate capsule. 12. Capsules (dry). 13. Peristome. 14. Lower portion of peristome tooth.

Family POLYTRICHACEAE

1. Leaf margins with differentiated border of elongated cells, doubly toothed; lamellae few, less than 10; calyptrae hispid .... 1. *Atrichum* (p. 665)
1. Leaf margins without border of elongated cells, entire or singly toothed; lamellae numerous, more than 10; calyptrae hairy 2
    2. Lamellae with marginal cells (terminal cells in leaf cross-section) papillose; capsules terete .... 2. *Pogonatum* (p. 675)
    2. Lamellae with marginal cells smooth or minutely papillose; capsules angled .... 3. *Polytrichum* (p. 682)

1. **Atrichum** P. Beauv., Mag. Encycl. 5: 329. 1804. *nom. cons.*

[Synonym: *Catharinea* Ehrh. *ex* Web. & Mohr]

Habit: In erect, loose tufts, sometimes gregarious.

Colour: Yellowish green to dark green above, becoming brown to reddish brown with age.

Stems: 0.5–6.0 cm high, erect, simple or sparingly branched, sparsely to densely foliose, reddish brown rhizoids at base, sometimes matted with whitish rhizoids nearly to apex.

Leaves: Erect to widely spreading, twisted and crisped when dry, keeled to concave above, concave to flat below, sometimes completely flat, smooth or undulate, dorsal surface with oblique rows of teeth, sometimes lacking, lamina unistratose except for bistratose margins, lingulate, lanceolate, ovate-lanceolate, or ovate, acute, sometimes lower leaves obtuse, nondecurrent. Perichaetial leaves similar to stem leaves except often longer.

Leaf Margins: Plane, bordered from base to apex with 2–3 rows of narrow, linear, thick-walled, smooth or papillose cells, the border usually bistratose, sometimes poorly developed or wanting near apex, toothed from apex to middle of leaf or below, the teeth single or double.

Costae: Single, subpercurrent to percurrent, dorsally toothed in upper half, rarely smooth, 1–9 lamellae on ventral surface, 1–14 cells high, sometimes lacking.

Leaf Cells: Smooth or dorsally papillose with minute, verrucose to striate papillae, walls thin to thick, often strongly collenchymatous, lacking pits. Median cells rounded, irregularly angled or hexagonal, often transversely elongate, becoming rectangular and longer near base.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous or polyoicous with some plants autoicous and others with only male or female organs. Monoicous plants with antheridia surrounding stem and archegonia in perichaetium above. Dioicous plants with males having 1-several perigonial buds, broad, short bracts forming cup-shaped buds.

Calyptrae: Cucullate, hispid or with a few papillae at the tip, sometimes smooth, yellowish with a reddish tip, fugacious.

Capsules: 1–3 per perichaetium, on a seta arising from stem apex, brown to reddish brown, cylindric to ovoid, straight to arcuate, erect to horizontal, finely striate when dry, stomata lacking.

Setae: Straight to flexuose, smooth, sometimes with a few twists when dry, brown to reddish brown, sometimes yellowish.

Annuli: Lacking.

Opercula: Long-rostrate, straight to arcuate.

Peristomes: Single, consisting of 32, white, yellow or light brown teeth with a dark mid-line, the teeth solid, smooth and undivided, the tips attached to a thin, whitish membrane (epiphragm).

Spores: Green to yellowish green, globose to ovoid, smooth or minutely papillose, 9–30 μm in longest dimension.

Nyholm (1971) revised the genus *Atrichum* on a worldwide scale. Ireland (1969a) studied some of the species in North America.

1. Median and upper leaf cells averaging 9–17 μm in longest dimension; leaves narrow, those near the middle of the stem less than 1 mm wide, often with 6 or more lamellae covering $^1/_3$ of leaf near middle; dioicous .... 1. *A. angustatum*
1. Median and upper leaf cells averaging 17 μm or more in longest dimension; leaves broad, those near the middle of the stem usually more than 1 mm wide with 0–6 (rarely up to 8) lamellae commonly covering less than $^1/_3$ of leaf; monoicous or dioicous 2
    2. Median leaf cells thin-walled, noncollenchymatous or sometimes slightly so, often more than 30 × 24 μm; teeth few or lacking on dorsal surface of leaf lamina; dioicous ... 3
        3. Median leaf cells averaging more than 20 μm in shortest dimension; cuticle of marginal leaf cells covered with minute verrucose or striate papillae; lamellae low, 1–4 cells high, sometimes lacking .... 5. *A. crispum*
        3. Median leaf cells averaging less than 20 μm in shortest dimension; marginal leaf cells smooth; lamellae high, 2–6 cells, always present .... 6. *A. tenellum*
    2. Median leaf cells often thick-walled and strongly collenchymatous, rarely reaching 30 × 24 μm; teeth numerous on dorsal surface of lamina; monoicous or dioicous 4
        4. Lamellae averaging 4–6 cells high (up to 9 cells high) on mature upper leaves; plants autoicous with antheridia in inflorescence below archegonia; capsules straight or subarcuate and erect to inclined .... 2. *A. altecristatum*
        4. Lamellae lower, averaging 2–4 cells high (up to 8 cells high); autoicous or dioicous 5
            5. Plants dioicous, stems commonly over 3 cm high, densely clothed with whitish rhizoids, leaves dense; capsules often over 5 mm long, erect or inclined, subarcuate; common in wet habitats .... 4. *A. oerstedianum*
            5. Plants monoicous (at least some individuals), stems seldom over 3 cm high and not noticeably clothed with whitish rhizoids, leaves distant; capsules (excluding operculum) rarely reaching 5 mm long, inclined to horizontal, strongly arcuate; common in dry habitats .... 3. *A. undulatum*

1. **Atrichum angustatum** (Brid.) B.S.G., Bryol. Eur. 4: 237, 411. 1844 (fasc. 21–22 Mon. 9.3). *Polytrichum angustatum* Brid., Spec. Musc. 1: 79. 1806.
[Synonyms: *A. macmillanii* (Holz.) Frye; *A. xanthopelma* (C. Müll.) Jaeg. & Sauerb.]
PLATE 381

Stems 1–2 cm high, leaves undulate, oblique rows of teeth on undulations on dorsal surface, keeled to concave above, concave below, narrowly lingulate to lanceolate, ovate-lanceolate near base of stems, acute, 4–8 mm long, 0.4–0.8 mm wide, margins bordered with smooth cells, costae dorsally toothed in upper half, lamellose on ventral surface with 6–9 lamellae, 5–10, rarely 14, cells high, leaf cells smooth or often with minute, verrucose or striate papillae on dorsal surface, median cells rounded to transversely elongate, walls thick, strongly collenchymatous, 9–17 μm in longest dimension, averaging less than 10 μm in shortest dimension; dioicous, male plants about same size as females, broad bracts forming antheridial buds, often more than one bud per plant, setae 1–2 cm long, 1–3 per perichaetium, capsules cylindric, usually subarcuate and inclined, sometimes straight and erect, urn 3–5 mm long, 0.3–0.6 mm wide, spores 12–16 μm in longest dimension.

Habitat: On soil bank in clearing in woodland.

Maritime Distribution: Rare. Nova Scotia (Digby). Known only from a single collection 11.2 km southwest of Acaciaville, 28 July 1974 (*Ireland 17909*).

Range: From southern Nova Scotia and Ontario, south to Florida, west to Minnesota, Nebraska, Kansas, Oklahoma, and Texas. Mexico, Europe.

Chromosome Number: n = 7, 8.

2. **Atrichum altecristatum** (Ren. & Card.) Irel., Can. J. Bot. 48: 1897. 1970.
Atrichum undulatum var. *altecristatum* Ren. & Card., Bot. Gaz. 15: 58. 1890.
[Synonyms: *Catharinea undulata* var. *allegheniensis* Jenn.; *A. undulatum* var. *allegheniensis* (Jenn.) Jenn.]
PLATE 382

Stems 1–3 cm high, leaves undulate, oblique rows of teeth on undulations on dorsal surface, keeled above, concave below, rarely flat, lingulate to lanceolate, ovate-lanceolate near base of stems, sometimes lower leaves obtuse, 2–8 mm long, 0.7–1.5 mm wide, margins bordered with smooth cells, costae dorsally toothed in upper half, lamellose on ventral surface with 4–6, rarely 8, undulate lamellae, 4–6, rarely 9, cells high, leaf cells smooth or occasionally with minute, verrucose or striate papillae on dorsal surface, median cells rounded to irregularly angled, often transversely elongate, walls thick, strongly collenchymatous, 9–28 μm in longest dimension, averaging less than 19 μm in shortest dimension; polyoicous, some plants autoicous, others with only male or female organs, setae 1.0–3.5 cm long, 1–3 per perichaetium, capsules cylindric, usually subarcuate and inclined, sometimes straight and erect, urn 2–7 mm long, 0.5–0.8 mm wide, spores 9–21 μm in longest dimension.

Habitat: On soil banks or hummocks, often in clearings in woodlands, frequently along roads or trails.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, King's, Madawaska, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Endemic to eastern North America, from Newfoundland to southern Manitoba, south to *North Carolina, Tennessee, Arkansas, and Kansas.

Chromosome Number: n = 14.

3. **Atrichum undulatum** (Hedw.) P. Beauv., Prodr. 42. 1805.

Polytrichum undulatum Hedw., Spec. Musc. 98. 1801.

PLATE 383

Stems 1–4 cm high, leaves sparse, undulate, oblique rows of teeth on undulations on dorsal surface, keeled above, concave to flat below, lingulate to lanceolate, acute, 4–9 mm long, 0.8–1.5 mm wide, margins bordered with smooth cells, costae dorsally toothed in upper half, lamellose on ventral surface with 2–6 lamellae, 2–4, rarely 8, cells high, leaf cells smooth or with minute, verrucose or striate papillae on dorsal surface, median cells irregularly angled to hexagonal, sometimes rounded, often transversely elongate, walls thick, strongly collenchymatous, 14–31 μm in longest dimension, averaging less than 19 μm in shortest dimension; polyoicous, some plants autoicous, others with only male or female organs, setae 1–3 cm long, 1 or rarely 2–3 per perichaetium, capsules cylindric, strongly arcuate, horizontal, urn 2–4 mm long, 0.5–1.0 mm wide, spores 19–26 μm in longest dimension.

Habitat: On soil in dry, weedy habitats, especially roadside ditches.

Maritime Distribution: Rare or seldom collected. Nova Scotia (Antigonish, Kings, St. Paul Island); Prince Edward Island (Kings, Queens).

Range: Poorly known in North America, seen from Newfoundland, Prince Edward Island, Nova Scotia, Ontario, and British Columbia. Europe, Asia, *Africa.

Chromosome Number: n = 7, 14, 21.

4. **Atrichum oerstedianum** (C. Müll.) Mitt., J. Linn. Soc. Bot. 12: 605. 1869.

Catharinea oerstediana C. Müll., Syn. 2: 558. 1851.

[Synonyms: *A. paraphyllium* Wareham; *A. undulatum* var. *oerstedianum* (C. Müll) Crum]

PLATE 384

Stems 2–6 cm high, often densely clothed with whitish rhizoids, leaves dense, undulate, oblique rows of teeth on undulations on dorsal surface, keeled above, concave below, rarely flat, lingulate to lanceolate, acute, 5-10 mm long, 0.8–1.5 mm wide, margins bordered with smooth cells, costae dorsally toothed in upper half, lamellose on ventral surface with 4–6 lamellae, 2–4 cells high, leaf cells smooth or often with minute, verrucose or striate papillae on dorsal surface, median cells rounded to irregularly angled, often transversely elongate, walls thick, strongly collenchymatous, 14–31 μm in longest dimension, averaging less than 19 μm in shortest dimension; dioicous, male plants about same size as females, broad bracts forming antheridial buds, often more than one bud per plant, setae 1.5–3.0 cm long, 1–3 per perichaetium, capsules cylindric, usually subarcuate and inclined, rarely straight and erect, urn 4–7 mm long, 0.5–1.0 mm wide, spores 12–19 μm in longest dimension.

Habitat: On soil in shaded situations, often in wet habitats along streams or sometimes at margins of swamps.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, Kent, King's, Madawaska, Restigouche, Victoria, Westmorland, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Pictou, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: In eastern North America from Labrador to Ontario, south to North Carolina, Tennessee, Mississippi, and Louisiana. Central and South America.

Chromosome Number: n = 14.

5. **Atrichum crispum** (James) Sull., Man. Bot. No. U.S. ed. 2: 641. 1856.
Catharinea crispa James, Proc. Acad. Nat. Sci. Philadelphia 7: 445. 1855.
PLATE 385

Stems 1–5 cm high, leaves smooth or rarely somewhat undulate, teeth lacking on dorsal surface of lamina, flat to slightly concave, ovate-lanceolate to ovate, acute, 3–7 mm long, 1–2 mm wide, margins bordered with papillose cells, the papillae minute, verrucose or striate, costae with a few teeth on dorsal surface near apex, rarely lacking, lamellose on ventral surface with 1–4 lamellae, 1–4 cells high, sometimes lacking, leaf cells smooth except for marginal cells, median cells hexagonal to irregularly angled, walls thin, not or weakly collenchymatous, 19–52 μm in longest dimension, averaging more than 25 μm in shortest dimension; dioicous, male plants about same size as females, broad bracts forming antheridial buds, often more than one bud per plant, setae 0.5–2.0 cm long, 1–3 per perichaetium, capsules cylindric to ovoid, straight to somewhat arcuate, erect to inclined, urn 1–3 mm long, 0.5–1.0 mm wide, spores 12–24 μm in longest dimension.

Habitat: Usually on sandy soil along streams and in roadside ditches in shaded situations, sometimes at margins of swamps.

Maritime Distribution: Frequent. New Brunswick (Albert, Charlotte, Kent, Saint John); Nova Scotia (Annapolis, Cumberland, Halifax, Hants, Lunenburg, Shelburne, Victoria); Prince Edward Island (Kings).

Range: In eastern North America from Nova Scotia to western Ontario, south to Florida, Tennessee, and Iowa. Europe.

Chromosome Number: n = 7.

Remarks: This species may easily be mistaken for a species of *Mnium* when sterile but the presence of lamellae immediately identifies it as an *Atrichum*. It is morphologically close to *A. tenellum* but differs in the lower lamellae that are sometimes lacking, the papillose marginal leaf cells, and the lack of teeth on the dorsal surface of the lamina.

6. **Atrichum tenellum** (Röhl.) B.S.G., Bryol. Eur. 4: 237. 412. 1844 (fasc. 21–22 Mon. 9.4).
Catharinea tenella Röhl., Ann. Wetterau. Ges. 3(2): 234. 1814.
PLATE 386

Stems 0.5–2.0 cm high, leaves smooth or rarely somewhat undulate, teeth lacking or rarely a few present on dorsal surface of lamina, keeled above, flat to concave below, lanceolate to ovate-lanceolate, acute, 2.5–6.0 mm long, 0.7–1.5 mm wide, margins bordered with smooth cells, costae with several teeth on dorsal surface near apex, lamellose on ventral surface with 2–5 lamellae, 2–6 cells high, leaf cells smooth, median cells hexagonal to irregularly angled, rarely rounded, walls thin, not or weakly collenchymatous, 19–24 μm in longest dimension, averaging more than 19 μm in shortest dimension; dioicous, male plants about same size as females, broad bracts forming antheridial buds, often more than one bud per plant, setae 1–2 cm long, 1–2 per perichaetium, capsules cylindric to ovoid, straight to somewhat arcuate, erect to inclined, urn 1–2 mm long, 0.5–0.8 mm wide, spores immature from Maritime plants but reported to be 15–30 μm in longest dimension.

Habitat: On soil in exposed habitats, especially roadside ditches and clearings in woodlands.

Maritime Distribution: Rare or seldom collected. New Brunswick (Charlotte, Kent, Westmorland, York); Prince Edward Island (Kings).

Range: Poorly known but seen in Canada from Labrador, Newfoundland, Prince Edward Island, New Brunswick, Quebec, Ontario, British Columbia, and in the United States from Wisconsin and Illinois. Europe, *Asia.

Chromosome Number: n = 14.

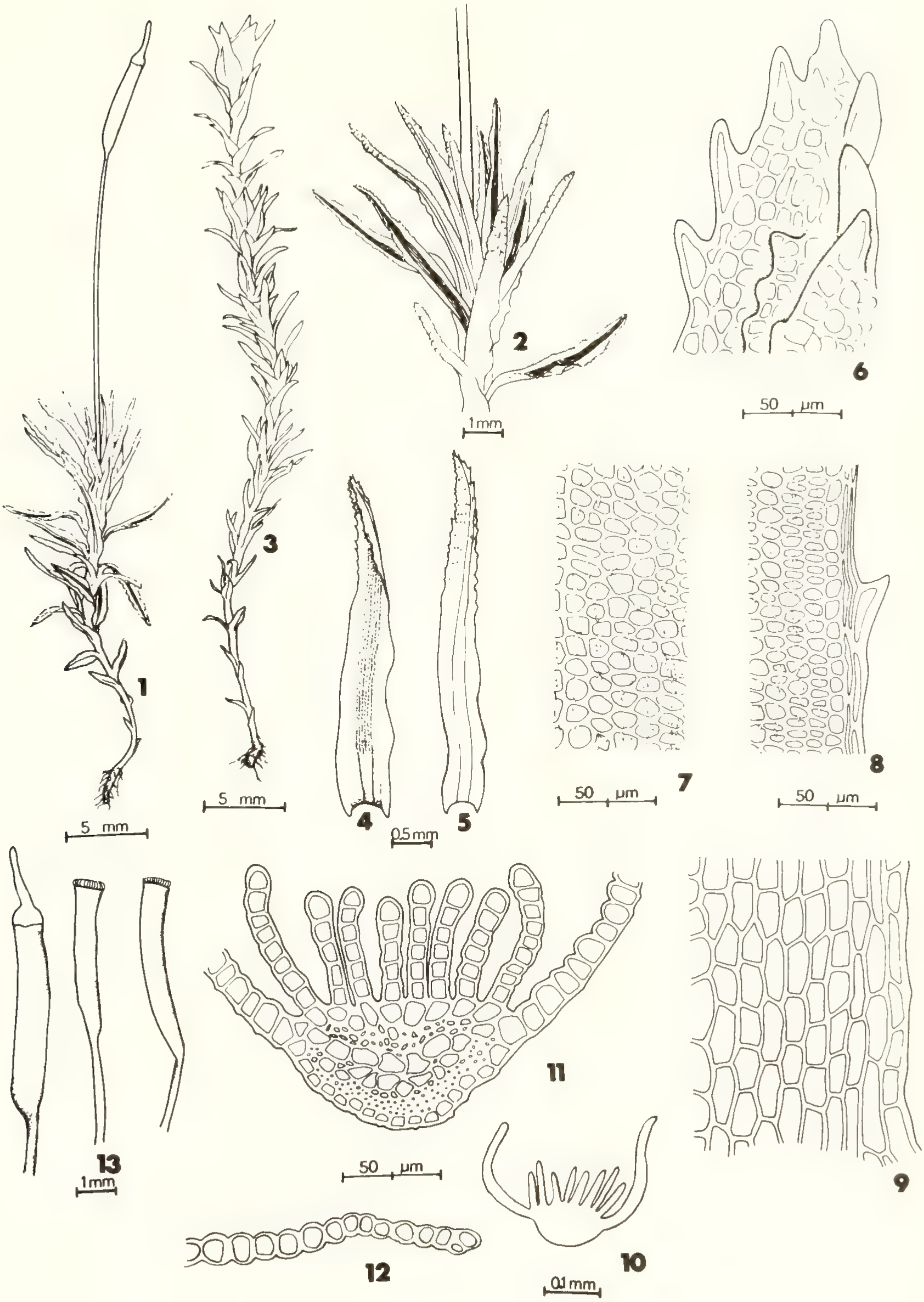
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Plate 381. *Atrichum angustatum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–9. Leaf cells (6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Cross-section of leaf near middle. 11. Cross-section of costa and lamellae near middle. 12. Cross-section of marginal leaf cells near middle. 13. Capsules, operculate (wet), inoperculate (dry).

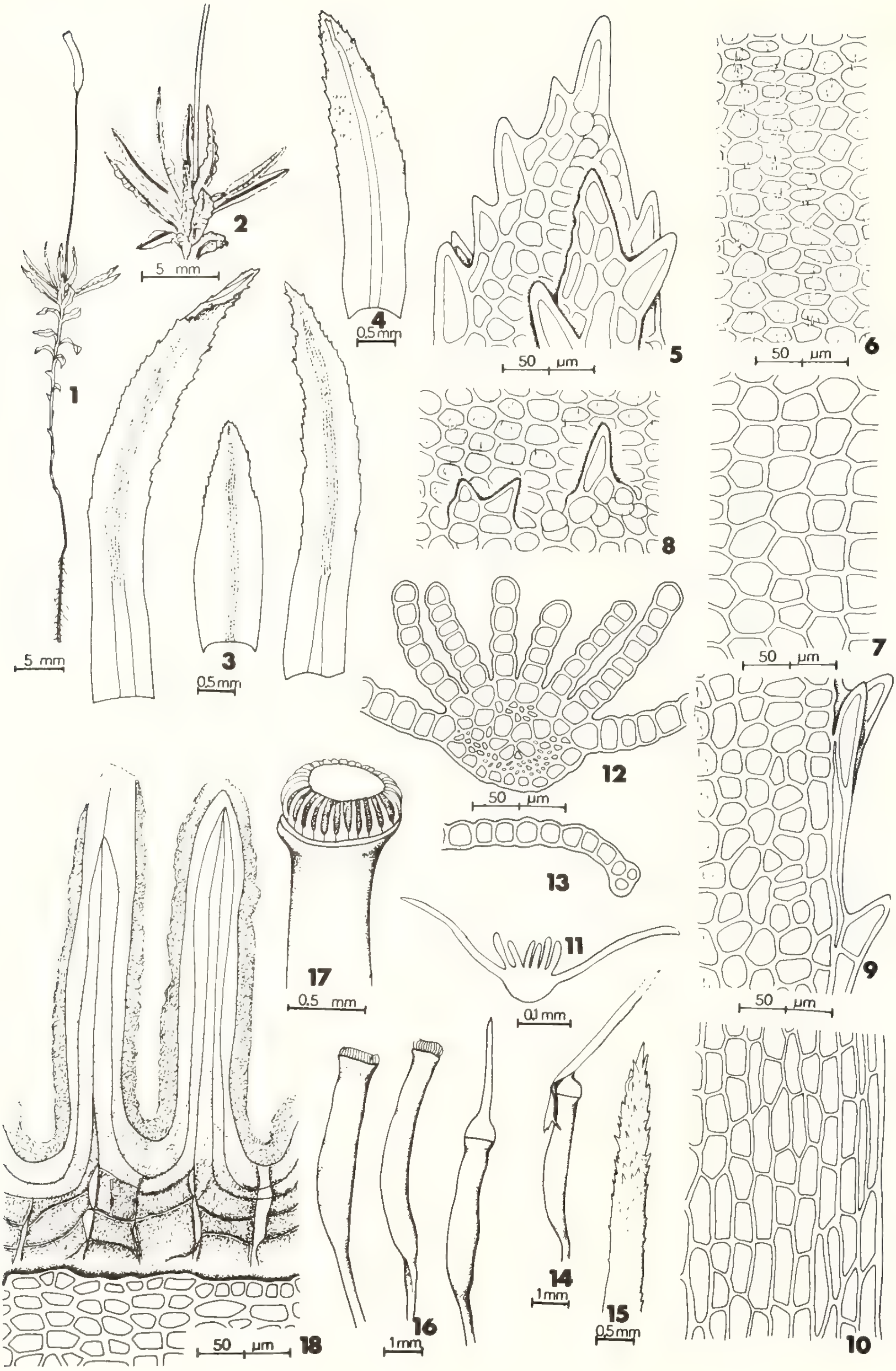
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Plate 382. *Atrichum altecristatum*. 1. Habit. 2. Portion of stem. 3. Leaves (ventral surface). 4. Leaf (dorsal surface). 5–7. Leaf cells (5, apical. 6–7, median.). 8. Dorsal teeth of leaf. 9–10. Leaf cells (9, median-marginal. 10, alar.). 11. Cross-section of leaf near middle. 12. Cross-section of costa and lamellae near middle. 13. Cross-section of marginal leaf cells near middle. 14. Calyptrate capsule. 15. Apical portion of calyptra. 16. Capsules, operculate (wet), inoperculate (dry). 17. Peristome. 18. Peristome teeth.

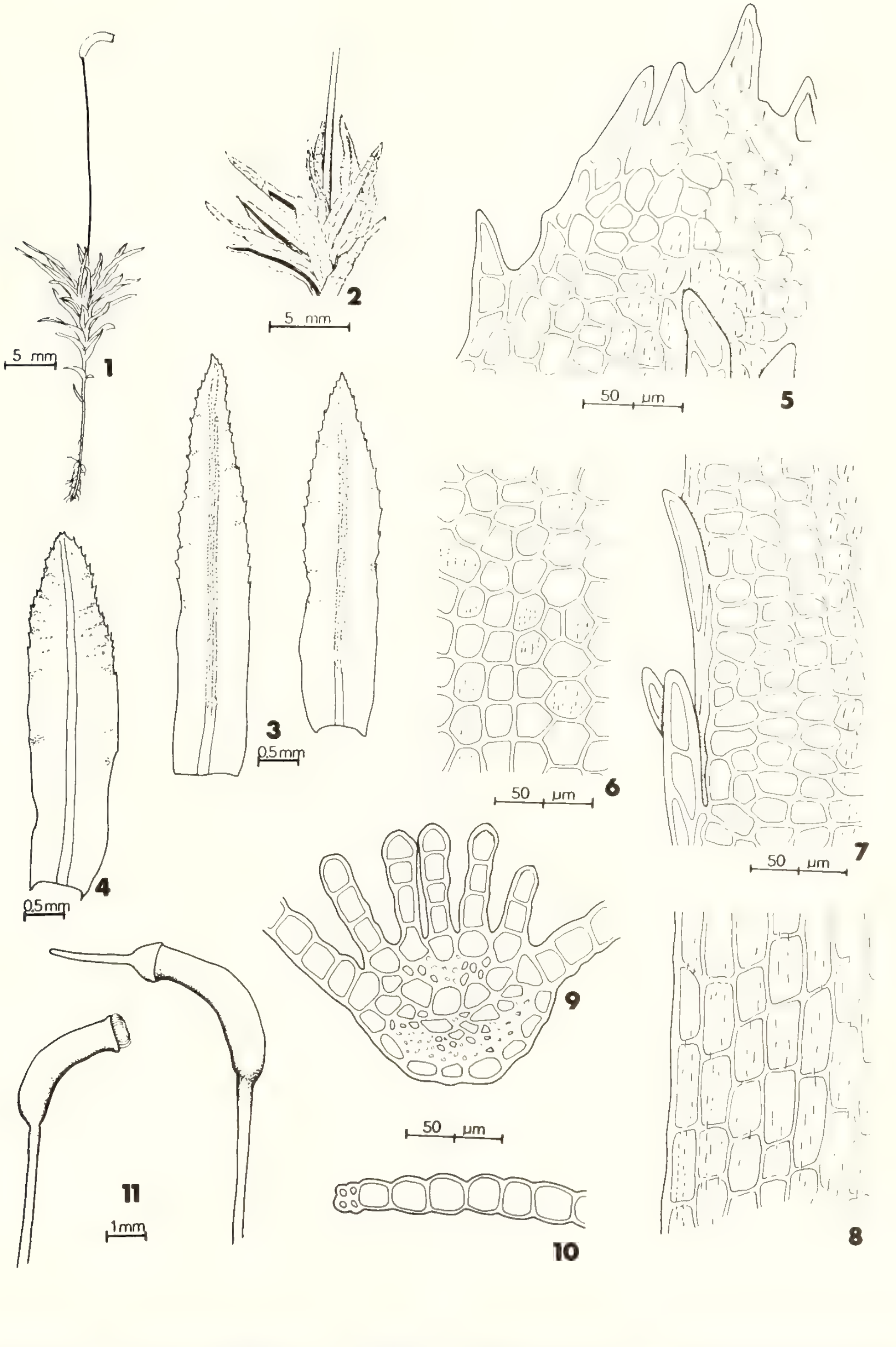
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Plate 383. *Atrichum undulatum*. 1. Habit. 2. Portion of stem. 3. Leaves (ventral surface). 4. Leaf (dorsal surface). 5–8. Leaf cells (5, apical. 6, median. 7, median-marginal. 8, alar.). 9. Cross-section of costa and lamellae near middle. 10. Cross-section of marginal leaf cells near middle. 11. Capsules, operculate (wet), inoperculate (dry).

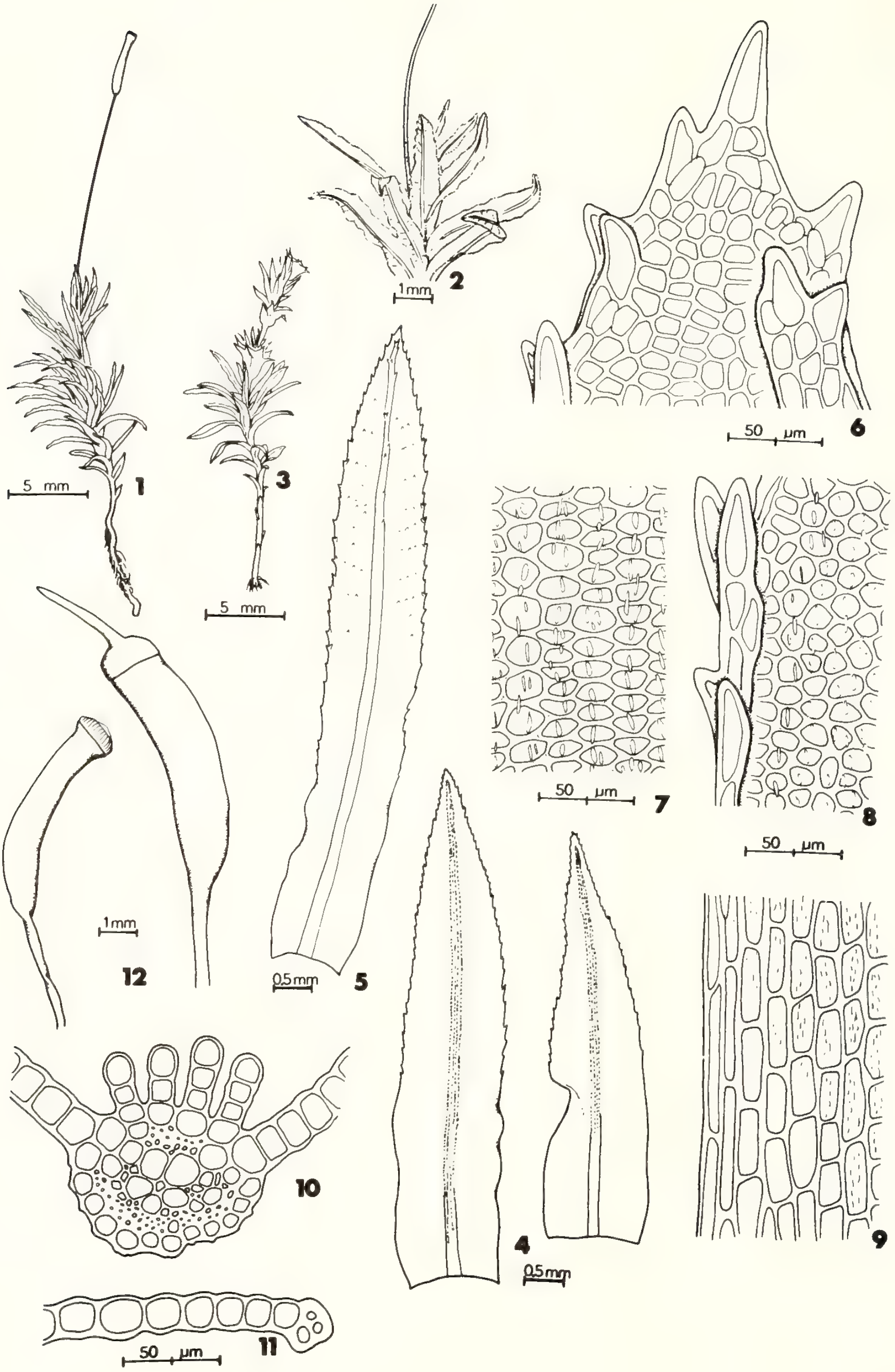

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Plate 384. *Atrichum oerstedianum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves (ventral surface). 5. Leaf (dorsal surface). 6–9. Leaf cells (6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Cross-section of costa and lamellae near middle. 11. Cross-section of marginal leaf cells near middle. 12. Capsules, operculate (wet), inoperculate (dry).

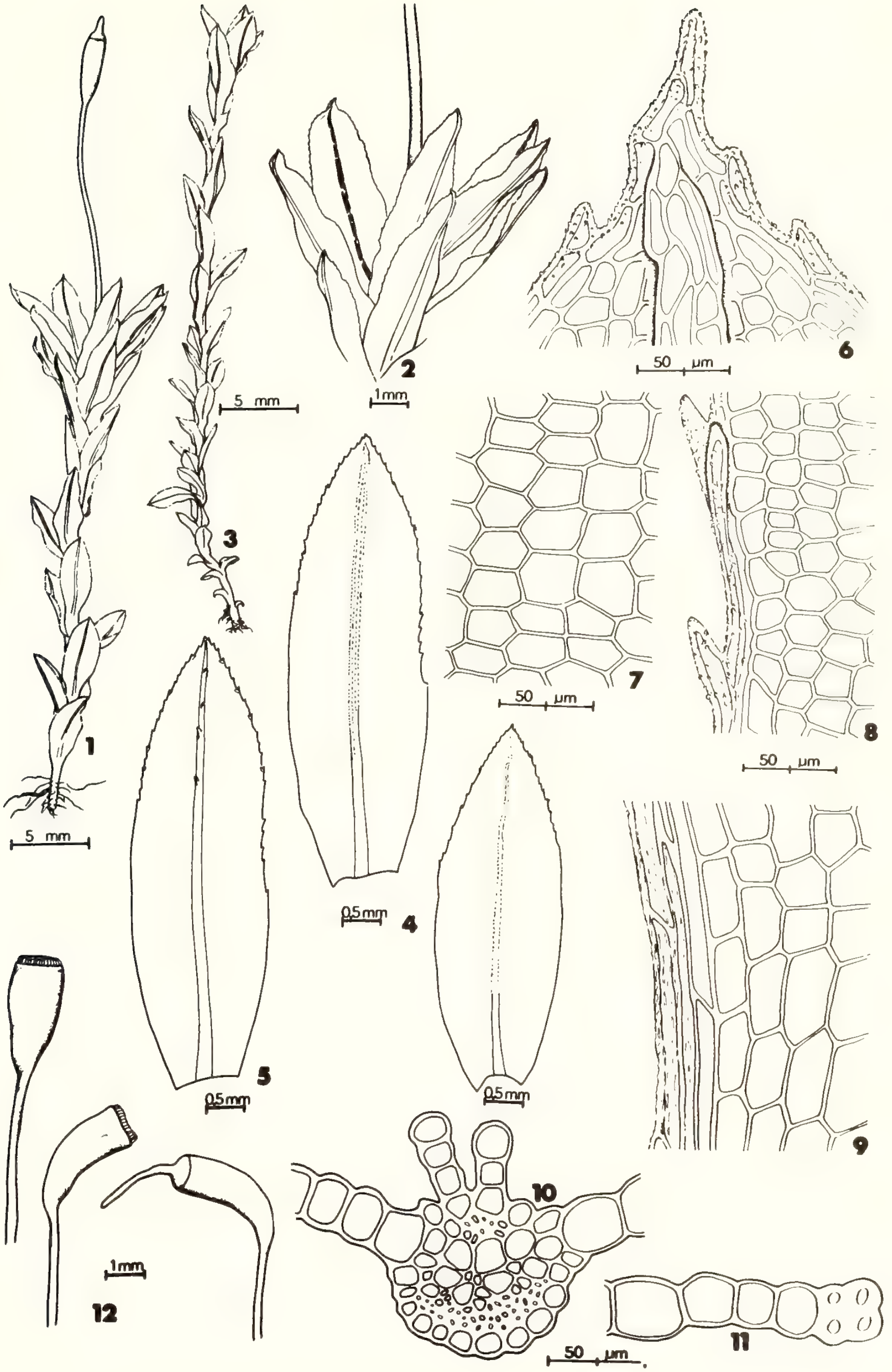
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Plate 385. *Atrichum crispum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves (ventral surface). 5. Leaf (dorsal surface). 6–9. Leaf cells (6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Cross-section of costa and lamellae near middle. 11. Cross-section of marginal leaf cells near middle. 12. Capsules, operculate (wet), inoperculate (dry).

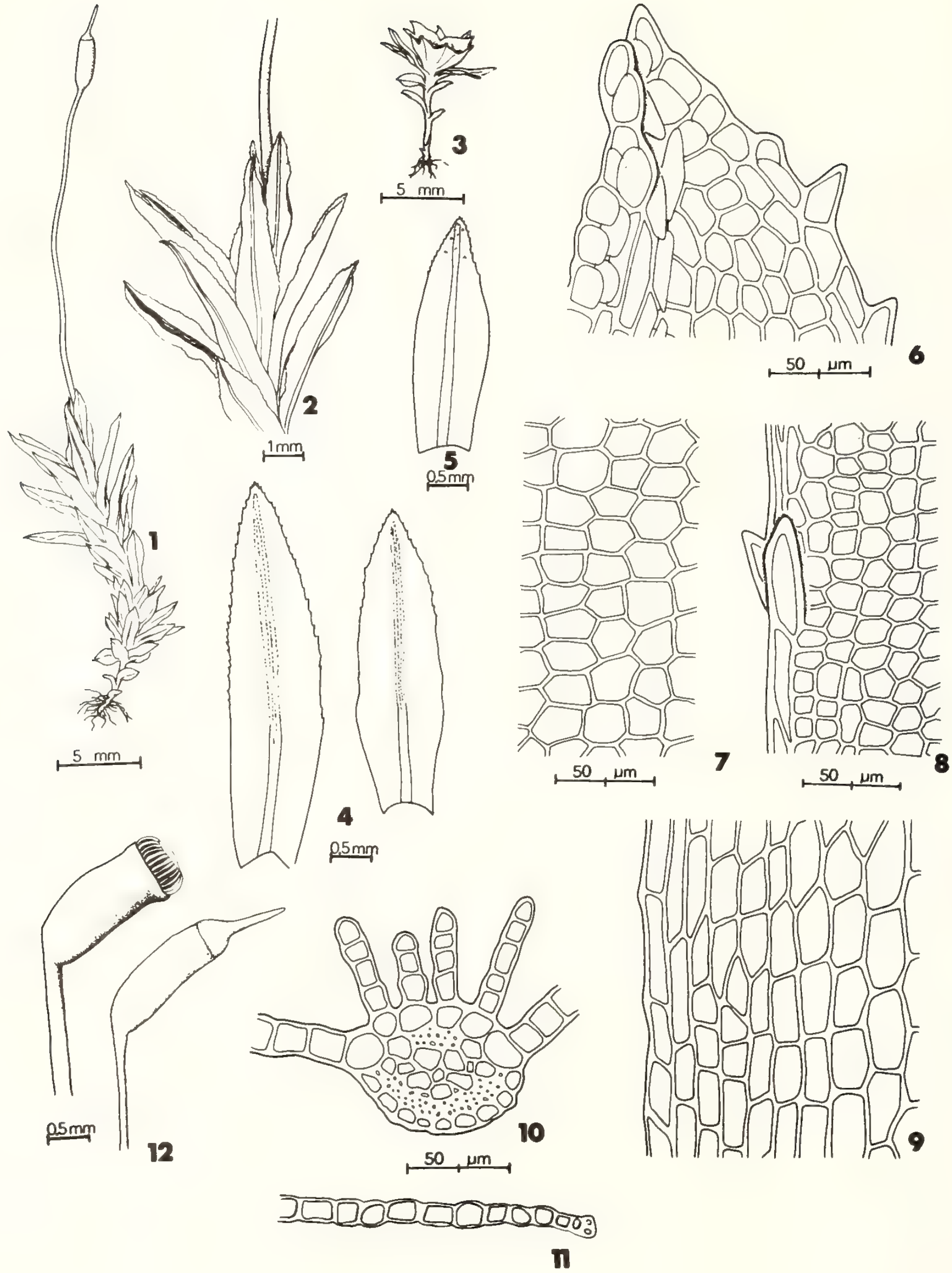
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Plate 386. *Atrichum tenellum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves (ventral surface). 5. Leaf (dorsal surface). 6–9. Leaf cells (6, apical. 7, median. 8, median-marginal. 9, alar.). 10. Cross-section of costa and lamellae near middle. 11. Cross-section of marginal leaf cells near middle. 12. Capsules, operculate (wet), inoperculate (dry).

2. **Pogonatum** P. Beauv., Mag. Encycl. 5: 329. 1804.

Habit: In erect, loose tufts, sometimes gregarious or scattered.

Colour: Dark green to yellowish green, dull, becoming brownish with age.

Stems: 0.3–9.0 cm high, erect, simple or branched, sparsely to densely foliose, reddish brown rhizoids at base, sometimes growing with an extensive, persistent, green felt-like protonema.

Leaves: Erect to recurved when moist, erect, contorted or flexuose, sometimes imbricate when dry, with a broad, erect, sheathing base, concave to flat above base, smooth, dorsal surface sometimes with a few scattered teeth, lamina unistratose or bistratose, lamellose on ventral surface with 10–60 lamellae, 3–9 cells high, the marginal cells unicellular, sometimes multicellular, the walls often thick and papillose, lanceolate to linear-lanceolate, acute, nondecurrent. Perichaetial leaves similar to stem leaves except sometimes longer.

Leaf Margins: Plane to erect, usually singly toothed from apex to near sheath, sometimes serrate, rarely entire.

Costae: Single, percurrent to shortly excurrent, dorsally toothed near apex, covered with lamellae on ventral surface above sheath, lacking on sheath.

Leaf Cells: Smooth or marginal cells of lamellae often papillose, the walls thick, lacking pits. Lamellae covering most of dorsal surface of leaf except for sheath and 2–8 cells along margins.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Male plants about size of females, sometimes much smaller, 1-several perigonial buds per plant, broad, short bracts forming cup-shaped buds.

Calyptrae: Mitrate, densely pilose, white or yellowish, covering all or most of capsule.

Capsules: 1–2 per perichaetium, on a seta arising from stem apex, brown to reddish brown, ovoid to cylindric, straight to subarcuate, erect to inclined, smooth, stomata lacking or present in neck.

Setae: Straight to flexuose, smooth, sometimes with a few twists when dry, brown to reddish brown.

Annuli: Lacking or present and poorly differentiated.

Opercula: Conic, often depressed at base of beak, straight to slightly arcuate.

Peristomes: Single, consisting of 32, brown or red teeth, sometimes divided to the middle, the teeth solid, smooth, the tips attached to a thin, whitish membrane (epiphragm).

Spores: Green to yellowish green, globose to ovoid, smooth or minutely papillose, 9–24 μm in longest dimension.

1. Gametophytes small, less than 8 mm high; lamellae few, 10–15 .... 1. *P. pensilvanicum*
1. Gametophytes large, 2–20 cm high; lamellae numerous, 25–60 2
    2. Plants with stems usually over 4 cm high; capsules over 3 mm long, stomata present .... 4. *P. alpinum*
    2. Plants with stems less than 4 cm high; capsules 3 mm long or less, stomata absent 3
        3. Stems mostly simple; marginal cells of lamellae flat-topped in cross-section, the lumen usually broader than long .... 2. *P. dentatum*
        3. Stems often branched; marginal cells of lamellae rounded in cross-section, the lumen usually longer than broad .... 3. *P. urnigerum*

1. Pogonatum pensilvanicum (Hedw.) P. Beauv., Mém. Soc. Linn. Paris 1: 461. 1823.
Polytrichum pensilvanicum Hedw., Spec. Musc. 96. 1801.
[Synonym: *P. brevicaule* P. Beauv.]
PLATE 387

Plants with an extensive, green, felt-like persistent protonema, stems simple, 0.1–0.6 cm high, leaves erect when wet, somewhat curled when dry, lanceolate, narrowed to a subula, acute, 2–5 mm long, 0.3–0.8 mm wide above sheath, not ending in a tooth, margins entire to serrate from apex to sheath, costae percurrent, smooth or dorsally toothed near apex, ventral surface with 10–15 lamellae, 4–7 cells high, the marginal cells often of several cells, rounded in cross-section, smooth, the walls similar in thickness to cells below; male plants about 1 mm high, perigonium cup-shaped, 1 per plant, setae 0.6–2.3 cm long, 1 per perichaetium, capsules cylindric, straight, erect to slightly inclined, urn 2–3 mm long, 0.5–1.0 mm wide, exothecial cells mammillose or papillose, stomata lacking, spores 9–14 μm in longest dimension.

Habitat: Commonly on bare clay banks in open situations, such as roadsides, streams, wooded clearings, etc.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Madawaska, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Colchester, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria); Prince Edward Island (Kings, Queens).

Range: In the eastern half of North America from Nova Scotia to Ontario, south to *Florida, Mississippi, Louisiana, and Kansas. Mexico, West Indies, South America.

Chromosome Number: n = 7.

2. **Pogonatum dentatum** (Brid.) Brid., Bryol. Univ. 2: 122. 1827.
Polytrichum dentatum Brid., J. f. Bot. 1800(2): 287. 1801.
[Synonym: *P. capillare* (Michx.) Brid.]
PLATE 388

Plants with stems mostly simple, rarely branched, 0.7–3.0 cm high, leaves erect to erect-spreading when wet, somewhat contorted when dry, linear-lanceolate, acute, 3–7 mm long, 0.5–1.0 mm wide above sheath, ending in a tooth, margins toothed from apex to sheath with multicellular teeth, costae percurrent to shortly excurrent, dorsally toothed near apex, ventral surface with 25–60 lamellae, 3–7 cells high, the marginal cells and often the lumen broader than high in cross-section, flat-topped, the outer wall thick and papillose; male plants somewhat smaller than female, perigonium cup-shaped, often several per plant, setae 1–3 cm long, 1–2 per perichaetium, capsules ovoid to cylindric, straight, erect to inclined, urn 1.5–3.0 mm long, 0.7–1.0 mm wide, exothecial cells mammillose or papillose, stomata lacking, spores 14–24 μm in longest dimension.

Habitat: On soil in the open, especially clearings in forests and roadside banks.

Maritime Distribution: Rare. New Brunswick (Charlotte, Madawaska); Nova Scotia (Colchester, Guysborough, Halifax, Inverness, Kings, Shelburne, Yarmouth).

Range: In eastern North America from Greenland and Labrador, south to Massachusetts, New York, *North Carolina, and Michigan; in the west from Alaska, British Columbia, Yukon Territory, and Alberta, Europe, Asia.

Chromosome Number: n = 7.

3. **Pogonatum urnigerum** (Hedw.) P. Beauv., Prodr. 85. 1805.
Polytrichum urnigerum Hedw., Spec. Musc. 100. 1801.
[Synonym: *P. urnigerum* var. *fasciculatum* (Michx.) Brid.]
PLATE 389

Plants with stems mostly branched, 1–4 cm high, leaves spreading when wet, erect and imbricate when dry, linear-lanceolate, acute, 3–7 mm long, 0.7–1.0 mm wide above sheath, ending in a tooth, margins toothed from apex to sheath with multicellular teeth, costae shortly excurrent, dorsally toothed near apex, ventral surface with 25–50 lamellae, 3–5 cells high, the marginal cells and often the lumen longer than broad in cross-section, rounded, the outer wall thick and papillose; male plants somewhat smaller than female, perigonium cup-shaped, often several per plant, setae 1.0–4.5 cm long, 1–2 per perichaetium, capsules ovoid to cylindric, straight or slightly arcuate, erect to inclined, urn 1.5–3.0 mm long, 0.5–1.0 mm wide, exothecial cells mammillose or papillose, stomata lacking, spores 14–19 μm in longest dimension.

Habitat: On gravelly or clay soil, sometimes over rock, usually in wooded clearings, stream and roadside banks.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Kent, Madawaska, Restigouche, Saint John, Victoria, York); Nova Scotia (Colchester, Cumberland, Halifax, Inverness, Kings, Lunenburg, Victoria); Prince Edward Island (Kings, Queens).

Range: Labrador to Alaska, south in the mountains and northern United States to New York, Wisconsin, Colorado, Montana, Idaho, and Oregon. *West Indies, Europe, Asia, *Africa.

Chromosome Number: n = 7.

4. **Pogonatum alpinum** (Hedw.) Röhl., Ann. Wetterau Ges. 3(2): 226. 1814.
Polytrichum alpinum Hedw., Spec. Musc. 92. 1801.
[Synonyms: *P. alpinum* var. *arcticum* (Brid.) Brid.; *Polytrichastrum alpinum* (Hedw.) G.L. Smith]
PLATE 390

Plants with stems usually branched, 2–9 cm high, leaves recurved when wet, erect-flexuose when dry, linear-lanceolate, acute, 4–15 mm long, 0.5–0.8 mm wide above sheath, ending in a tooth, margins toothed from apex to sheath with multicellular teeth, costae excurrent, dorsally toothed near apex, ventral surface with 25–50 lamellae, 4–9 cells high, the marginal cells and often the lumen longer than broad in cross-section, rounded, the outer wall thick and papillose; male plants somewhat smaller or about size of female, perigonium cup-shaped, often several per plant, setae 1–4 cm long, 1–2 per perichaetium, capsules cylindric, usually subarcuate and inclined, sometimes straight and erect, urn 4–5, rarely 2–6, mm long, 0.8–1.5 mm wide, stomata at base, exothecial cells smooth, spores 14–19 μm in longest dimension.

Habitat: On soil over boulders, cliff shelves and in cliff crevices, predominantly in coniferous forests.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Restigouche, Saint John, York); Nova Scotia (Cape Breton, Colchester, Cumberland, Digby, Guysborough, Inverness, Kings, Lunenburg, Victoria).

Range: From Greenland and Labrador to Alaska, southward in the mountains and northern states to North Carolina, West Virginia, Michigan, Minnesota, Colorado, Utah, Idaho, and California. South America, Europe, Asia, *Africa, Australia, New Zealand, *Antarctica.

Chromosome Number: $n = 7, 14$.

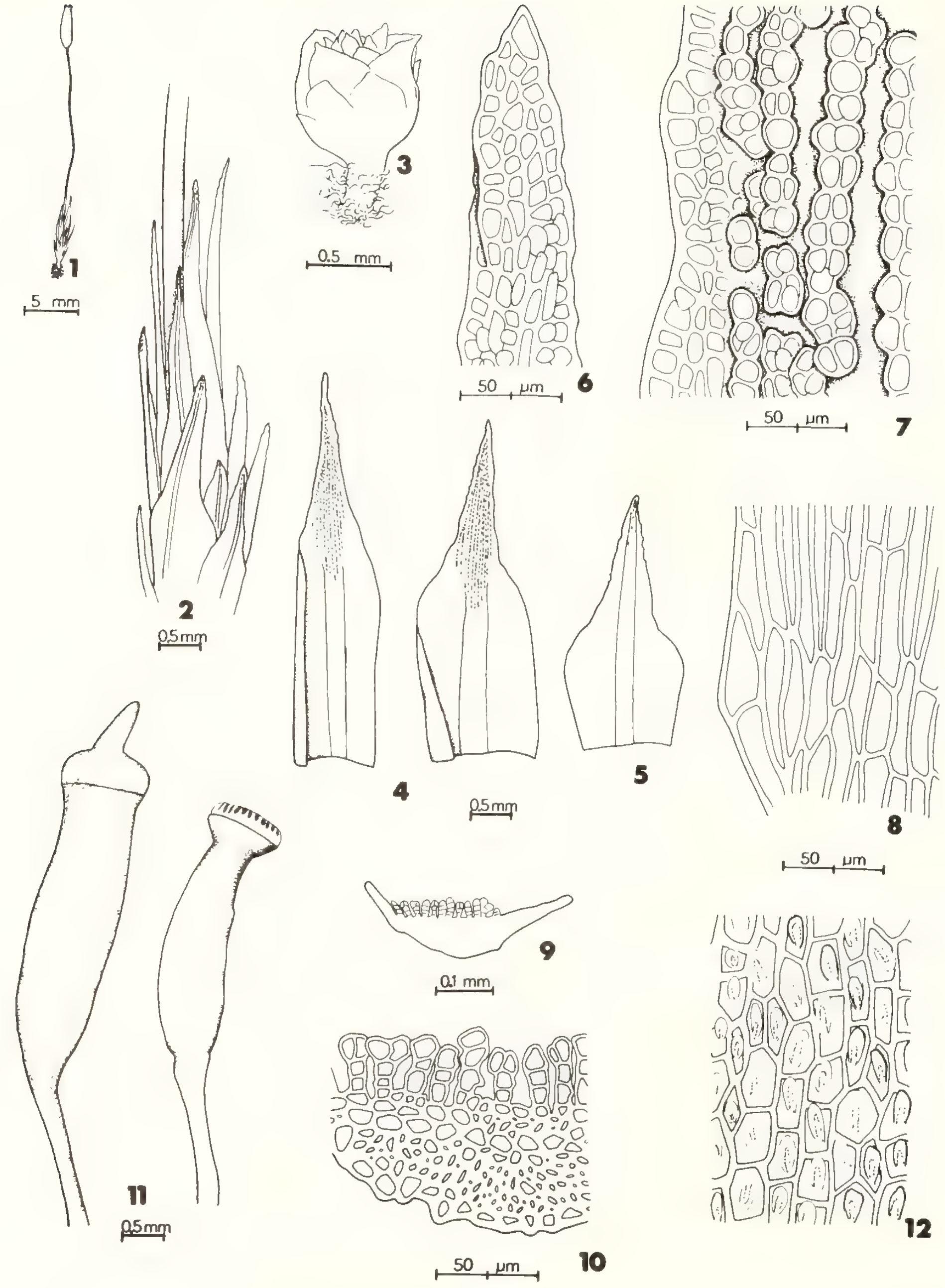
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Plate 387. *Pogonatum pensilvanicum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Capsules, operculate (wet), inoperculate (dry). 12. Exothecial cells.

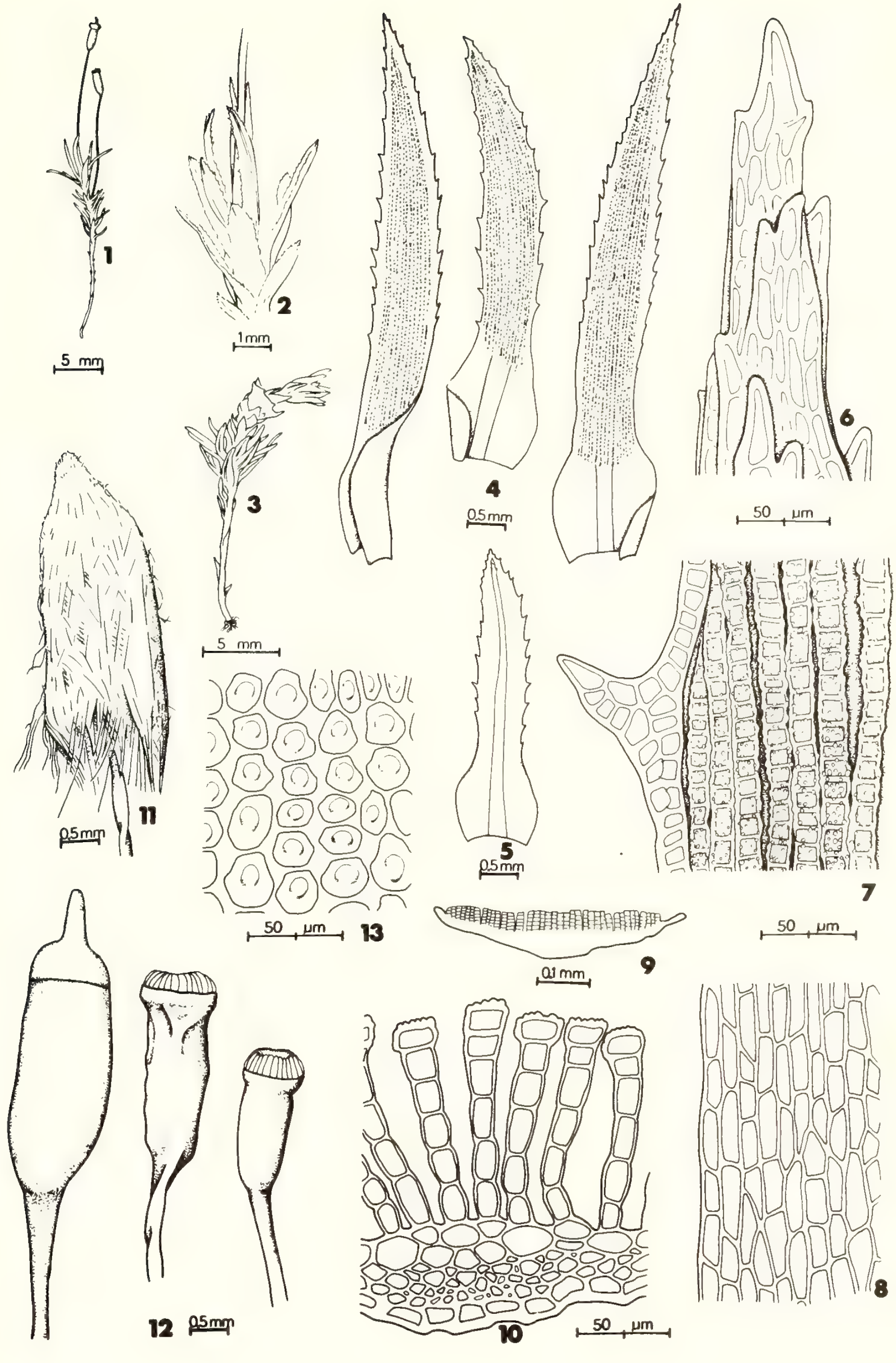
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Plate 388. *Pogonatum dentatum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Calyptrate capsule. 12. Capsules, operculate (wet), inoperculate (dry). 13. Exothecial cells.

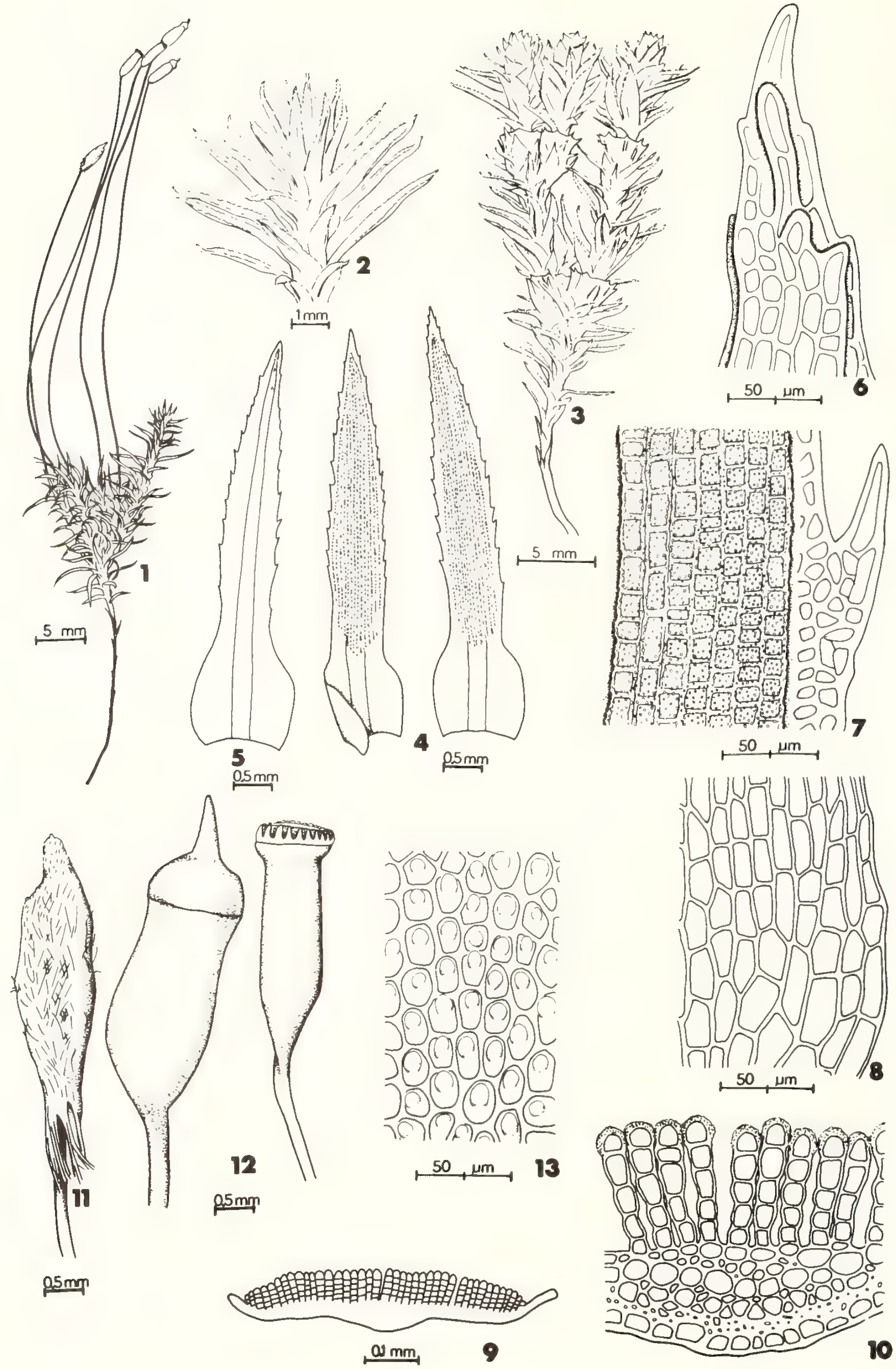
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Plate 389. *Pogonatum urnigerum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaves (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Calyptrate capsule. 12. Capsules, operculate (wet), inoperculate (dry). 13. Exothecial cells.

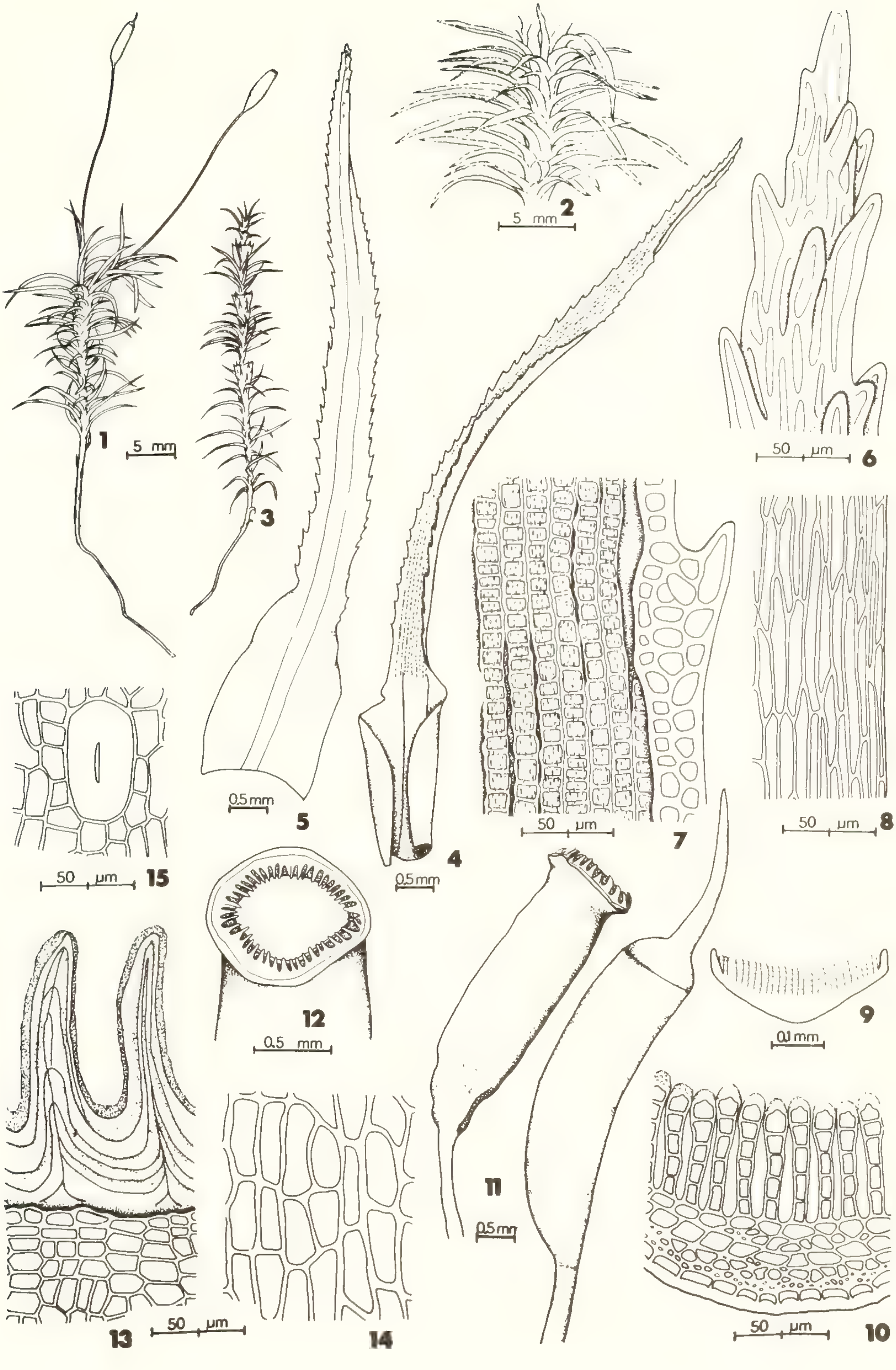
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Plate 390. *Pogonatum alpinum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, alar.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Capsules, operculate (wet), inoperculate (dry). 12. Peristome. 13. Peristome teeth. 14. Exothecial cells. 15. Stomata.

3. **Polytrichum** Hedw., Spec. Musc. 88. 1801.

Habit: In erect, loose to dense tufts, sometimes scattered.

Colour: Green to bluish green, becoming brown to reddish brown with age.

Stems: 1–30 cm high, erect, simple or rarely branched, sparsely to densely foliose, rhizoids at base, sometimes extending nearly to apex.

Leaves: Erect-spreading to recurved when moist, erect to flexuose, sometimes imbricate or with recurved tips when dry, with a broad, erect, sheathing base, concave or flat above base, smooth, dorsal surface sometimes spinulose, lamina unistratose, lamellose on ventral surface with 20–60 lamellae, 3–10 cells high, the marginal cells unicellular, often thick-walled, smooth, sometimes depressed or notched in the middle in cross-section, linear-lanceolate to lanceolate, acute or with a hyaline or reddish, spinulose awn, nondecurrent. Perichaetial leaves sometimes with membraneous margins and longer than stem leaves.

Leaf Margins: Plane, erect, or infolded from above the sheath to base of awn, singly toothed from apex to near sheath or entire when infolded.

Costae: Single, excurrent, often as a hyaline or reddish, spinulose awn, dorsally toothed or spinulose above, covered with lamellae on ventral surface above sheath, lacking on sheath.

Leaf Cells: Smooth, the walls thick, lacking pits, lamellae often covering most of dorsal surface of leaf, lacking on sheath and infolded leaf margins.

Asexual Reproductive Bodies: Lacking.

Sex: Dioicous. Male plants about size of female, perigonium cup-shaped, often several per plant.

Calyptrae: Mitrate, densely pilose, white, brown or yellowish brown, covering all or most of capsule.

Capsules: 1 per perichaetium, on a seta arising from stem apex, brown to reddish brown, cubic to oblong, straight, erect to horizontal, 4-angled, with a hypophysis, stomata present in neck.

Setae: Straight to flexuose, smooth, sometimes with a few twists when dry, brown to reddish brown.

Annuli: Lacking or poorly differentiated.

Opercula: Rostrate, straight to arcuate.

Peristomes: Single, consisting of 64, white or brown teeth, the teeth solid, smooth, the tips attached to a thin, whitish membrane (epiphragm).

Spores: Green to yellowish green, globose to ovoid, smooth or minutely papillose, 7–28 μm in longest dimension.

1. Leaf margins folded over upper surface of leaf, entire except at apex 2
    2. Leaves ending abruptly in a long, hyaline awn . . . . 1. *P. piliferum*
    2. Leaves ending gradually in a short, reddish brown awn 3
        3. Stems long, often over 5 cm high, commonly matted with whitish rhizoids; plants of bogs . . . . 3. *P. strictum*
        3. Stems short, seldom up to 5 cm, rhizoids scarcely noticeable; plants of dry habitats . . . . 2. *P. juniperinum*
1. Leaf margins plane when wet, serrate from apex to leaf sheath 4
    4. Marginal cells of lamellae flat-topped or notched in cross-section, often thick-walled 5
        5. Stems large, often over 5 cm high; many marginal cells of lamellae strongly notched in cross-section, walls not or little thicker than other lamellae cells; capsules about as long as wide 6
            6. Inner perichaetial leaves not or just exceeding upper leaves; plants mainly of bogs . . . . 7. *P. commune*
            6. Inner perichaetial leaves extending 1–2 mm above upper leaves; plants mostly of relatively dry habitats . . . . 7a. *P. commune* var. *perigoniale*
        5. Stems small, rarely up to 5 cm; marginal cells of lamellae not or weakly notched in cross-section, the walls noticeably thicker than other lamellae cells; capsules longer than wide . . . . 6. *P. ohioense*

4. Marginal cells of lamellae rounded in cross-section, all the lamellae walls the same thickness 7
    7. Lamellae numerous, covering most of the leaf except for 2-8 cells along the margins; capsules mostly over 4 mm long; plants of moderately dry habitats .... 4. *P. formosum*
    7. Lamellae few, often covering only $^1/_3$-$^1/_2$ of leaf, rarely extending to within 5-10 cells of the margins; capsules mostly less than 4 mm long; plants of fens and other wet habitats .... 5. *P. longisetum*

1. **Polytrichum piliferum** Hedw., Spec. Musc. 90. 1801.

PLATE 391

Stems simple, 1-4 cm high, leaves erect-spreading when wet, erect and often curved toward stem when dry, with a broad, erect, brown to reddish brown, sheathing base, linear-lanceolate, acute, 4-7 mm long, 0.4-0.7 mm wide above sheath, ending abruptly in a hyaline, spinulose awn, 1-3 mm long, margins infolded from above the sheath to base of awn, entire, costae excurrent, smooth on dorsal surface below awn, costae and portion of laminae lamellose on ventral surface with 25-35 lamellae, 4-8 cells high, the marginal cells conic or pyriform, thicker walled than other lamellae cells; calyptrae white to light brown, setae 2.0-3.5 cm long, capsules reddish brown, oblong, rarely cubic, with a hypophysis, urn 2-4 mm long, 1-2 mm wide, spores 9-12 μm in longest dimension.

Habitat: On sandy or gravelly soil in open, often disturbed sites, especially fields, roadbanks and borrow pits.

Maritime Distribution: Common. New Brunswick (Charlotte, Gloucester, Kent, Restigouche, York); Nova Scotia (Annapolis, Cape Breton, Digby, Halifax, Hants, Inverness, Kings, Lunenburg, Victoria); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to North Carolina, Louisiana, Colorado, *Utah, and California. South America, Europe, Asia, *Africa, *Australia, *Pacific Islands, *Antarctica.

Chromosome Number: n = 7, 14.

2. **Polytrichum juniperinum** Hedw., Spec. Musc. 89. 1801.

PLATE 392

Stems simple or rarely branched, 2-8 cm high, leaves erect-spreading to wide-spreading when wet, erect-imbricate to spreading when dry, with a broad, erect, brown to reddish brown, sheathing base, linear-lanceolate, acute, 5-9 mm long, 0.7-1.0 mm wide above sheath, ending in a brown to reddish brown, spinulose awn, 0.5-2.0 mm long, margins infolded from above the sheath to base of awn, entire, costae excurrent, spinulose on dorsal surface to near middle of leaf, costae and portion of laminae lamellose on ventral surface with 25-45 lamellae, 4-7 cells high, the marginal cells conic or pyriform, thicker walled than other lamellae cells; calyptrae white to light brown, setae 2-6 cm long, capsules reddish brown, oblong, rarely cubic, with a hypophysis, urn 2-5 mm long, 1-2 mm wide, spores 7-9 μm in longest dimension.

Habitat: Frequently on soil or soil over rock in dry, open, mainly disturbed situations, often on roadbanks, in logged woodlands, etc.

Maritime Distribution: Common. New Brunswick (Albert, Carleton, Charlotte, Gloucester, King's, Madawaska, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Digby, Inverness, Kings, Lunenburg, Queens, Victoria, Yarmouth, Sable Island); Prince Edward Island (Kings, Prince, Queens).

Range: Greenland to Alaska, south to Alabama, Arkansas, Kansas, Colorado, Arizona, and California. Central and South America, West Indies, Europe, Asia, Australia, New Zealand.

Chromosome Number: n = 7.

3. **Polytrichum strictum** Brid., J. f. Bot. 1800(2): 286. 1801.

[Synonyms: *P. juniperinum* var. *strictum* (Brid.) Röhl.; *P. juniperinum* var. *alpestre* (Hopp.) Röhl.; *P. juniperinum* var. *gracilius* Wahlenb.]

PLATE 393

Stems simple or rarely branched, usually matted with whitish rhizoids to near apex, 3-15 cm high, leaves erect-spreading when wet, erect-imbricate when dry, with a broad, erect, brown to reddish brown, sheathing base, linear-lanceolate, acute, 4-6 mm long, 0.4-0.8 mm wide above sheath, ending in a brown to reddish brown, spinulose awn, 0.5-1.5 mm long, margins infolded from above the sheath to base of awn, entire, costae excurrent, spinulose on dorsal surface to near middle of leaf, costae and portion of laminae lamellose on ventral surface with 25-40 lamellae, 4-7 cells high, the marginal cells conic or pyriform, thicker walled than other lamellae cells; calyptrae white to light brown, setae 2–5 cm long, capsules reddish brown, oblong to cubic, with a hypophysis, urn 2–3 mm long, 1.0–1.5 mm wide, spores 7–9 μm in longest dimension.

Habitat: In bogs or at margins of bogs in hummocks often among *Sphagnum*.

Maritime Distribution: Common. New Brunswick (Charlotte, Gloucester, Kent, Saint John, Westmorland); Nova Scotia (Annapolis, Antigonish, Cape Breton, Colchester, Halifax, Inverness, Lunenburg, Shelburne, Victoria, Yarmouth, Sable Island); Prince Edward Island (Kings).

Range: Greenland to Alaska, south in the mountains to North Carolina, *Ohio, Michigan, *Illinois, Minnesota, Colorado, Montana, and Washington. *South America, Europe, *Asia, *Antarctica.

Chromosome Number: n = 7, 14.

4. **Polytrichum formosum** Hedw., Spec. Musc. 92. 1801.

[Synonym: *P. gracile* var. *anomalum* (Milde) Hag.]

PLATE 394

Stems simple, 2–12 cm high, leaves spreading to recurved when wet, erect to flexuose when dry, with a broad, erect, yellowish to reddish brown sheathing base, linear-lanceolate to lanceolate, acute, 5–10 mm long, 0.7–1.0 mm wide above sheath, ending in a toothed apex, margins plane or erect, toothed from apex to near sheath, costae excurrent, dorsally toothed above, costae and all of laminae, except 2–8 cells on margins near the middle of the leaf, lamellose on ventral surface with 30–60 lamellae, 3–5 cells high, the marginal cells rounded in cross-section, sometimes somewhat thicker than other lamellae cells; calyptrae yellowish brown, setae 2–7 cm long, capsules yellowish brown, oblong, with a hypophysis, urn 2–6 mm long, 1–2 mm wide, spores 9–14 μm in longest dimension.

Habitat: On soil or humus often over rock, in woodlands, frequently beside streams.

Maritime Distribution: Rare or overlooked. New Brunswick (Gloucester, Restigouche, York); Nova Scotia (Annapolis, Cape Breton, Lunenburg, Victoria); Prince Edward Island (Queens).

Range: Newfoundland to *Alaska, south to North Carolina, Tennessee, Michigan, Minnesota, Wyoming, Montana, and Washington. Europe, Asia, *Africa, *New Zealand.

Chromosome Number: n = 7, 14.

5. **Polytrichum longisetum** Brid., J. f. Bot. 1800(2): 286. 1801.

[Synonyms: *P. gracile* Dicks.; *P. formosum* var. *aurantiacum* (Brid.) Hartm.]

PLATE 395

Stems simple, 2–9 cm high, leaves spreading to recurved when wet, erect to flexuose when dry, with a broad, erect, yellowish to reddish brown sheathing base, lanceolate, acute, 4–9 mm long, 0.5–1.0 mm wide above sheath, ending in a toothed apex, margins plane or erect, toothed from apex to near sheath, costae excurrent, dorsally toothed above, costae and all of laminae, except 5–10 cells on margins near the middle of the leaf, lamellose on ventral surface with 20–45 lamellae, 3–5 cells high, the marginal cells rounded in cross-section, sometimes somewhat thicker than other lamellae cells; calyptrae yellowish brown, setae 3–7 cm long, capsules yellowish brown, oblong to ovoid, with a hypophysis, urn 3–4 mm long, 1–2 mm wide, spores 19–28 μm in longest dimension.

Habitat: In extremely wet situations, especially fens and bogs.

Maritime Distribution: Rare. New Brunswick (Albert, Charlotte, Madawaska); Nova Scotia (Cape Breton Island [no county information], Halifax, Kings).

Range: Labrador to Alaska, south to North Carolina, Michigan, Illinois, Minnesota, Colorado, and California. *South America, Europe, *Asia, New Zealand.

Chromosome Number: n = 7, 14.

6. **Polytrichum ohioense** Ren. & Card., Rev. Bryol. 12: 11. 1885.

PLATE 396

Stems simple, 2–7 cm high, leaves widely spreading to recurved when wet, erect to flexuose when dry, with a broad, erect, yellowish to reddish brown, sheathing base, linear-lanceolate, acute, 5–10 mm long, 0.6–1.0 mm wide above sheath, ending in a toothed apex, margins plane or erect, toothed from apex to near sheath, costae excurrent, dorsally toothed above, costae and most of laminae lamellose on ventral surface with 25–50 lamellae, 3–6 cells high, the marginal cells usually brown, flat-topped or sometimes slightly depressed, thicker walled than other lamellae cells; calyptrae yellowish brown, setae 2–5 cm long, capsules yellowish brown, oblong, with an indistinct hypophysis, urn 3–5 mm long, 1.0–1.5 mm wide, spores 9–14 μm in longest dimension.

Habitat: On soil or humus over boulders, stumps, and overturned tree roots in woodlands.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, King's, Madawaska, Restigouche, Saint John, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Guysborough, Halifax, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Yarmouth); Prince Edward Island (Prince, Queens).

Range: Newfoundland to Wisconsin and Iowa, south to *Alabama, *Mississippi, *Arkansas, and Kansas; also in *New Mexico. Europe, *Asia.

Chromosome Number: n = 14.

7. Polytrichum commune Hedw., Spec. Musc. 88. 1801.

PLATE 397

Stems usually simple, 4–30 cm high, leaves spreading to recurved when wet, erect or often recurved at the tips when dry, with a broad, erect, whitish or yellowish brown sheathing base, linear-lanceolate, acute, 6–12 mm long, 0.7–1.0 mm wide above sheath, ending in a toothed apex, margins plane or erect, toothed from apex to near sheath, costae excurrent, dorsally toothed above, costae and most of laminae lamellose on ventral surface with 40–60 lamellae, 4–10 cells high, the marginal cells depressed or notched in the middle in cross-section, sometimes somewhat thicker than other lamellae cells; calyptrae yellowish brown, setae 4–9 cm long, capsules reddish brown, cubic, with a hypophysis, urn 2–5 mm long, 1.5–2.5 mm wide, spores 9–12 μm in longest dimension.

Habitat: Usually in bogs or in wet woods.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Gloucester, Kent, King's, Madawaska, Northumberland, Victoria, York); Nova Scotia (Annapolis, Colchester, Cumberland, Halifax, Inverness, Kings, Lunenburg, Queens, Shelburne, Victoria, Sable Island); Prince Edward Island (Prince, Queens).

Range: Greenland to Alaska, south to the Gulf States, Colorado, *Arizona, and California. *South America, Europe, Asia, *Africa, Australia, New Zealand, Pacific Islands.

Chromosome Number: n = 7, 14.

7a. Polytrichum commune var. **perigoniale** (Michx.) Hampe, Linnaea 13: 44. 1839.

P. perigoniale Michx., Fl. Bor. Amer. 2: 293. 1803.

[Synonym: *P. commune* ssp. *perigoniale* (Michx.) Kindb.]

PLATE 398

Similar to var. *commune* but differing in the longer perichaetial bracts which extend 1–3 mm above the vegetative leaves.

Habitat: Mostly in drier habitats than the var. *commune*, especially in open disturbed sites, such as roadside banks.

Maritime Distribution: Common. New Brunswick (Albert, Charlotte, Kent, Queen's, Saint John, Victoria, York); Nova Scotia (Annapolis, Cape Breton, Colchester, Cumberland, Digby, Halifax, Hants, Inverness, Lunenburg, Queens, Shelburne, Victoria, Yarmouth, Sable Island); Prince Edward Island (Kings, Queens).

Range: Poorly known but apparently the same as that of var. *commune*.

Chromosome Number: Unreported.

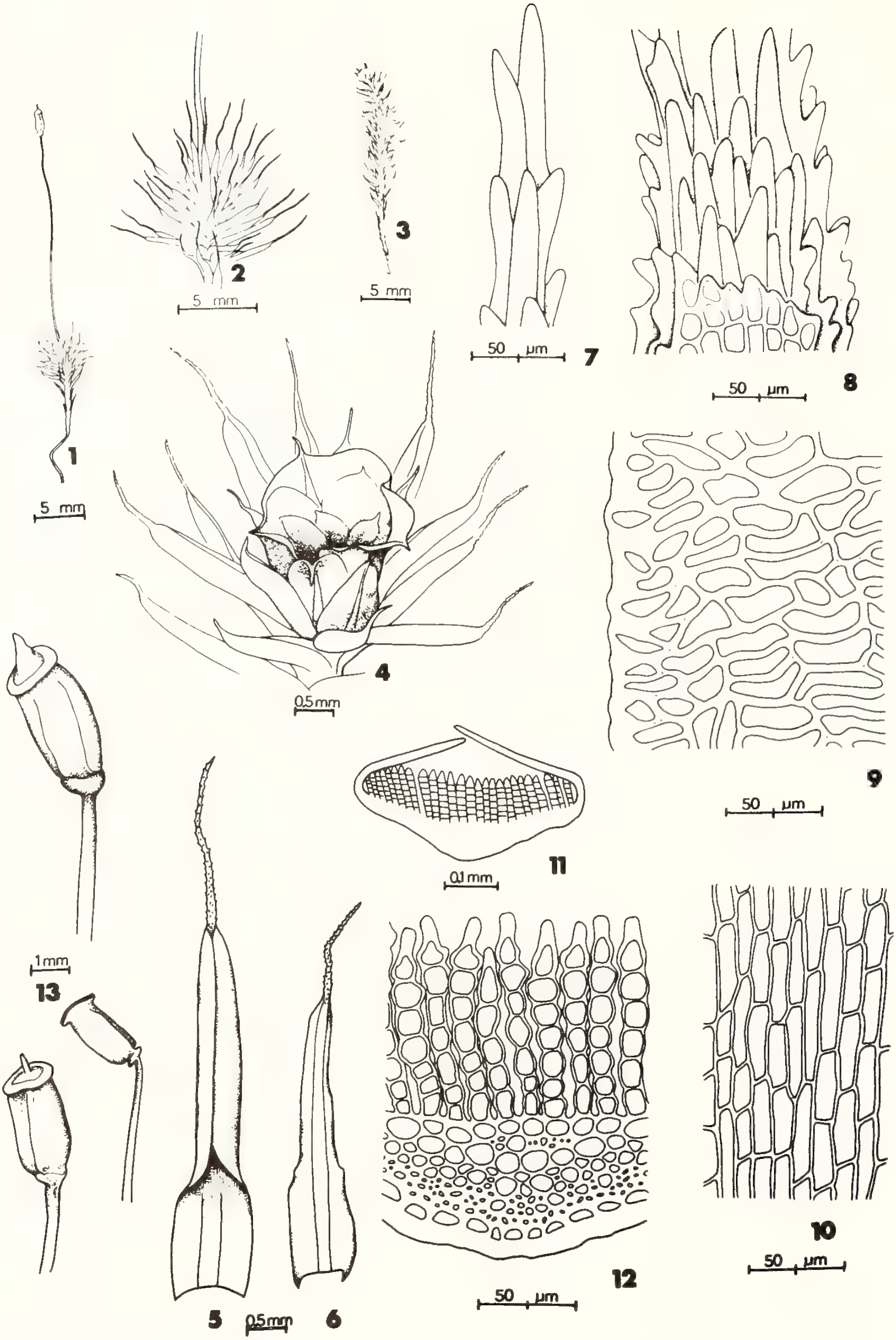
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Plate 391. *Polytrichum piliferum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Perigonial bud. 5. Leaf (ventral surface). 6. Leaf (dorsal surface). 7. Enlargement of apical portion of leaf awn. 8–10. Leaf cells (8, apical and lower portion of awn. 9, median-marginal. 10, median of sheath.). 11. Cross-section of leaf near middle. 12. Cross-section of portion of leaf and lamellae near middle. 13. Capsules, operculate above (wet), below (dry), inoperculate (dry).

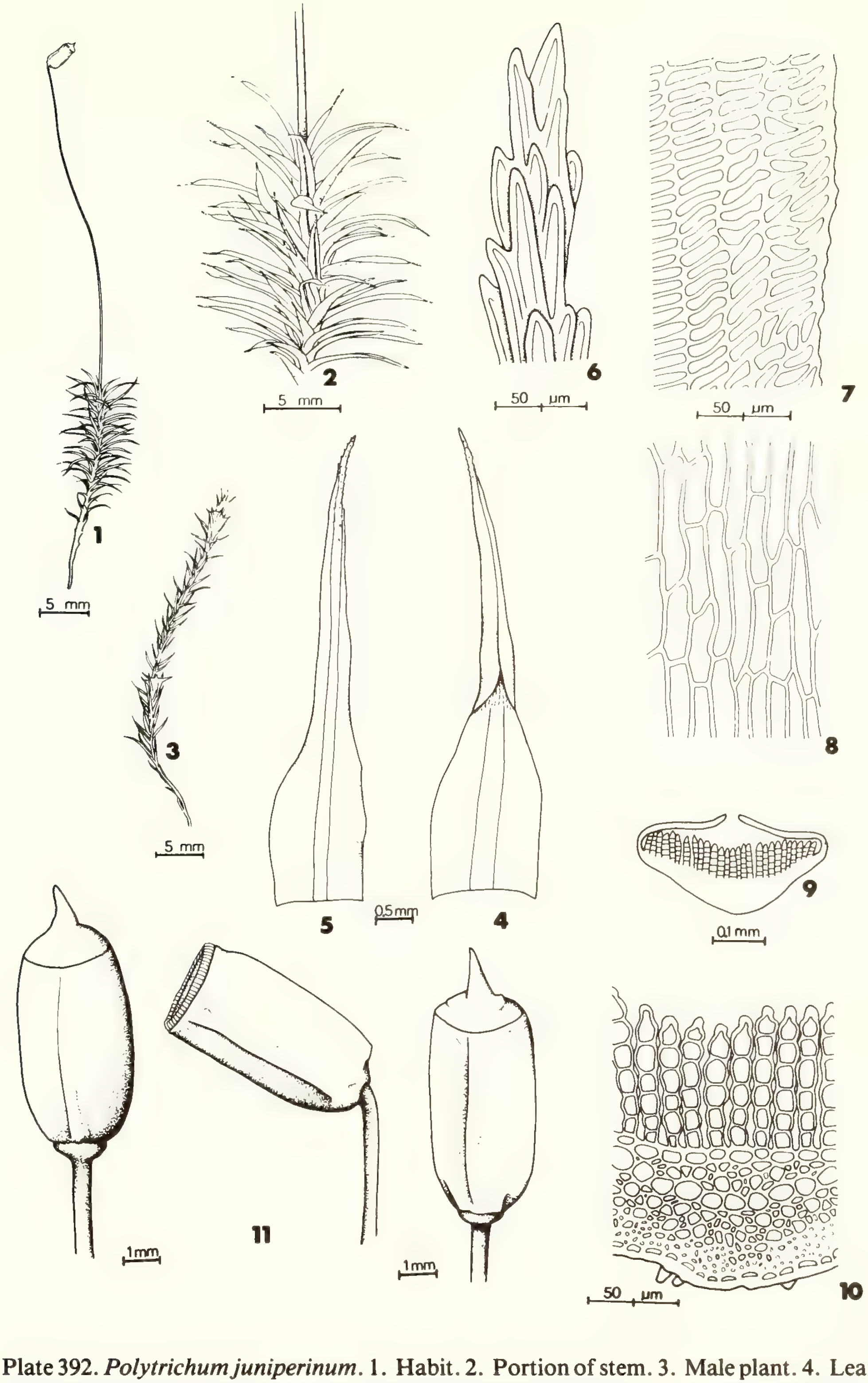
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Plate 392. *Polytrichum juniperinum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, median cells of sheath.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Capsules, operculate at left (wet), at right (dry), inoperculate (dry).

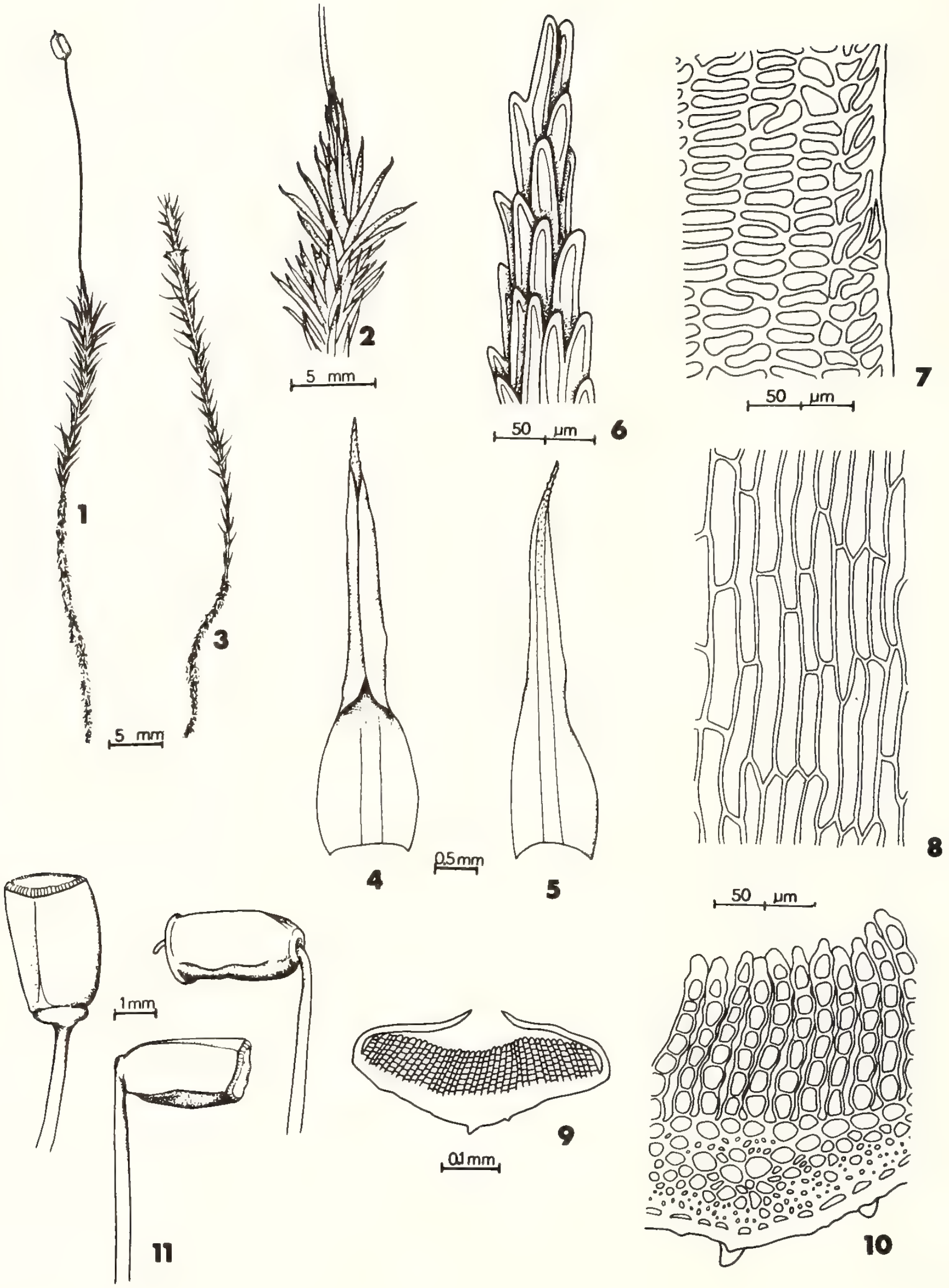
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Plate 393. *Polytrichum strictum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, median of sheath.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Capsules, operculate (wet), inoperculate (dry).

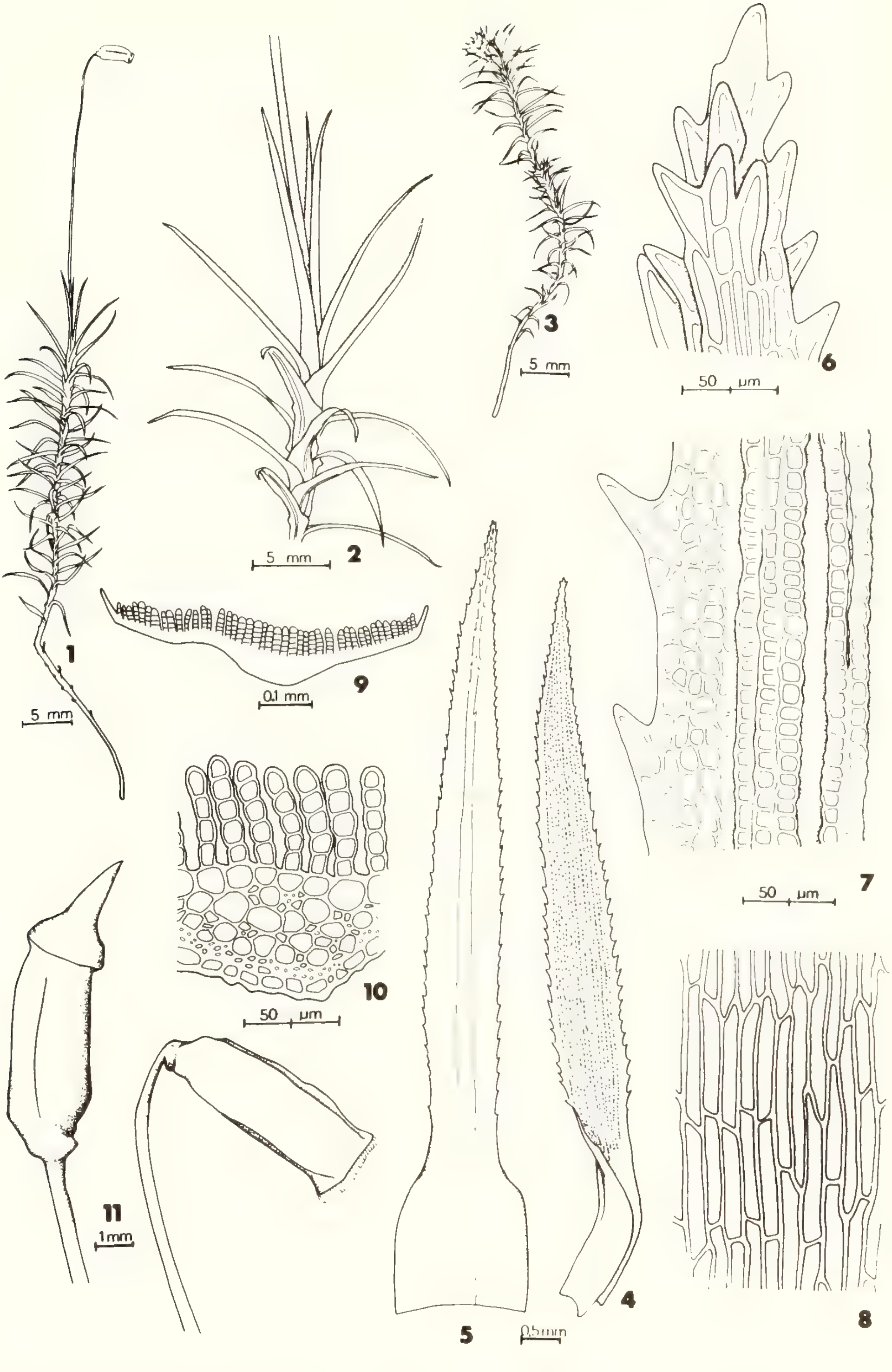
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Plate 394. *Polytrichum formosum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, median of sheath.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Capsules, operculate (wet), inoperculate (dry).

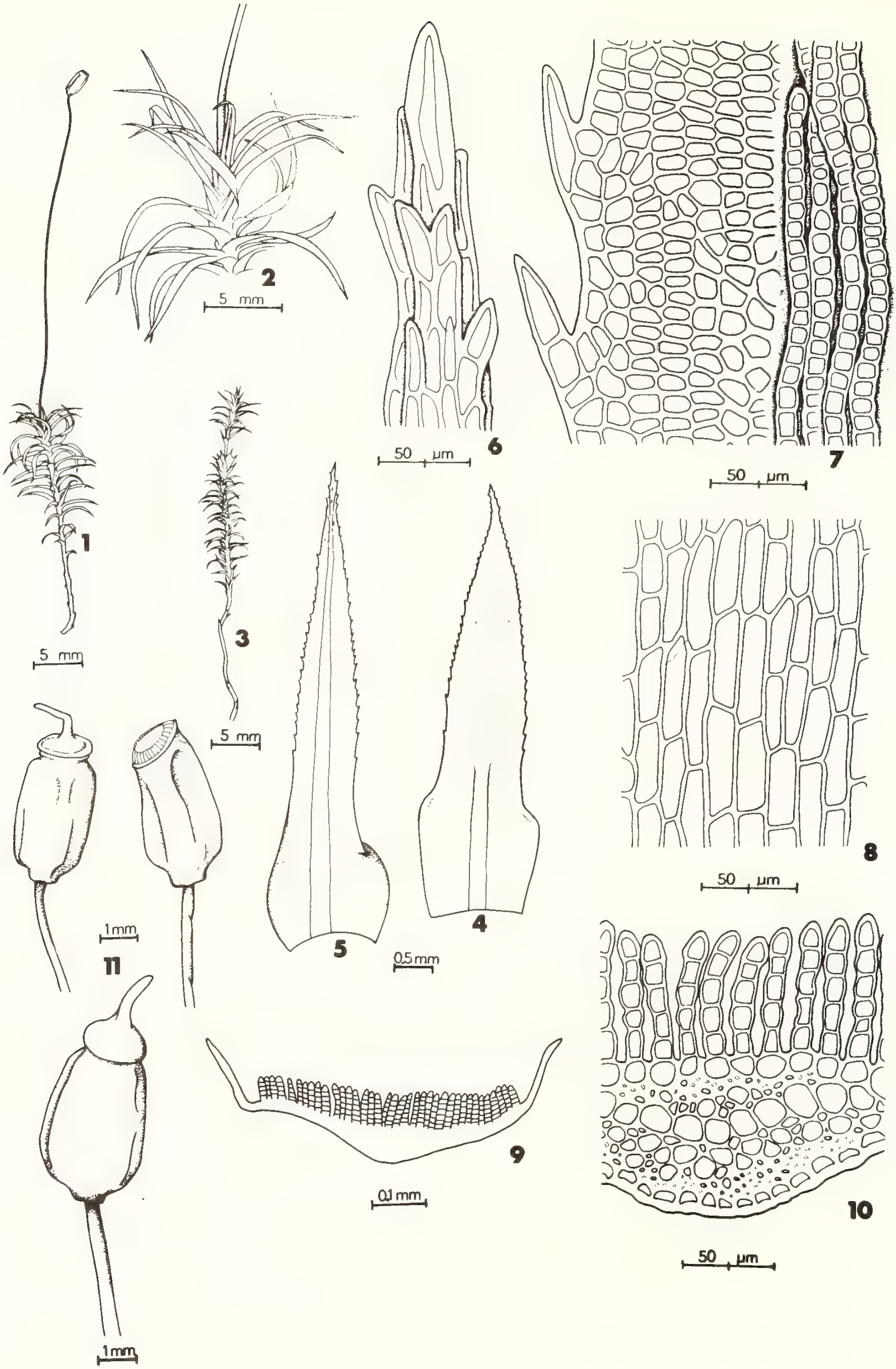
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Plate 395. *Polytrichum longisetum*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, median of sheath.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Capsules, operculate above (dry), below (wet), inoperculate (dry).

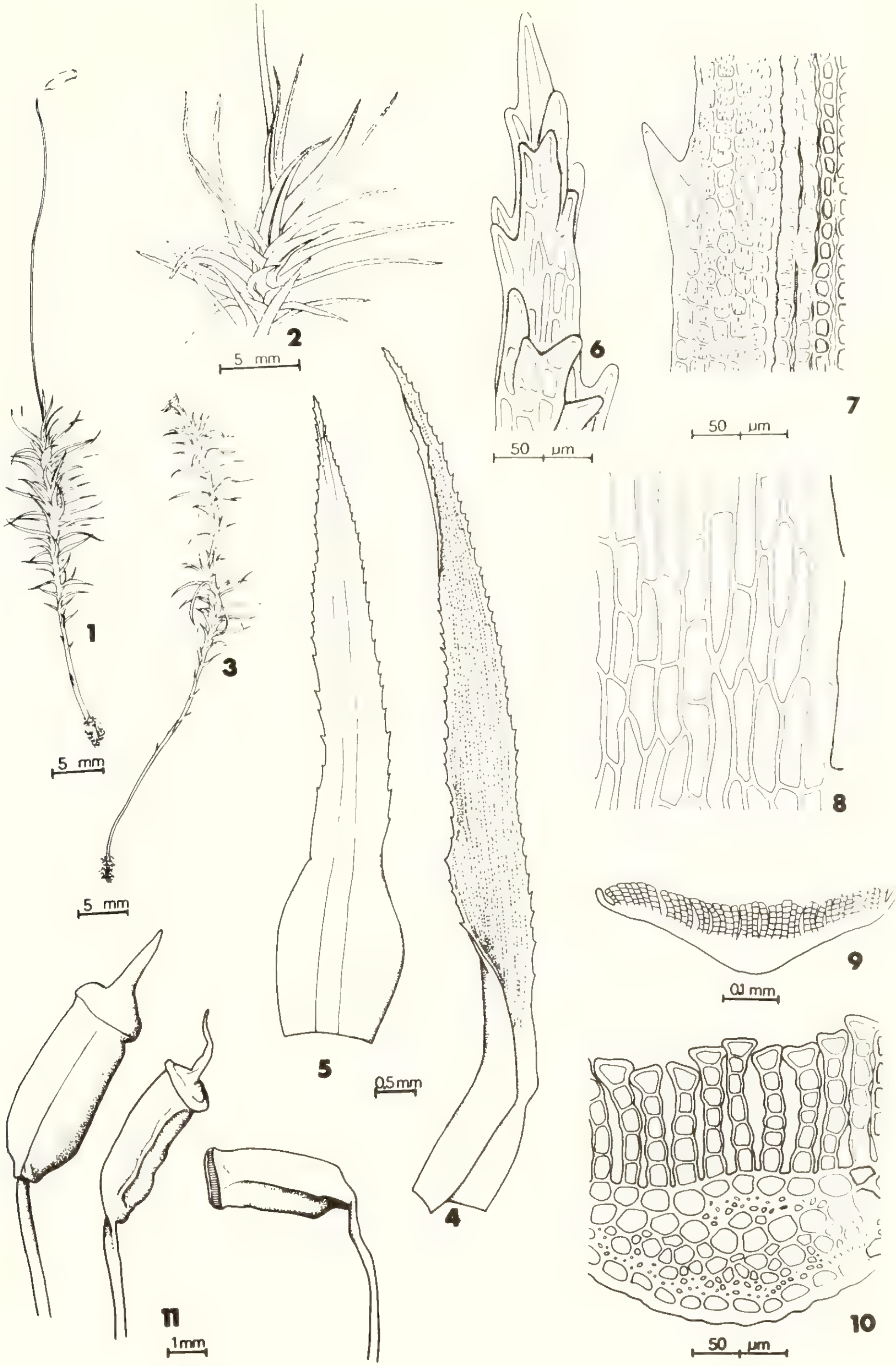
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Plate 396. *Polytrichum ohioense*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, median of sheath.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Capsules, operculate at left (wet), at right (dry), inoperculate (dry).

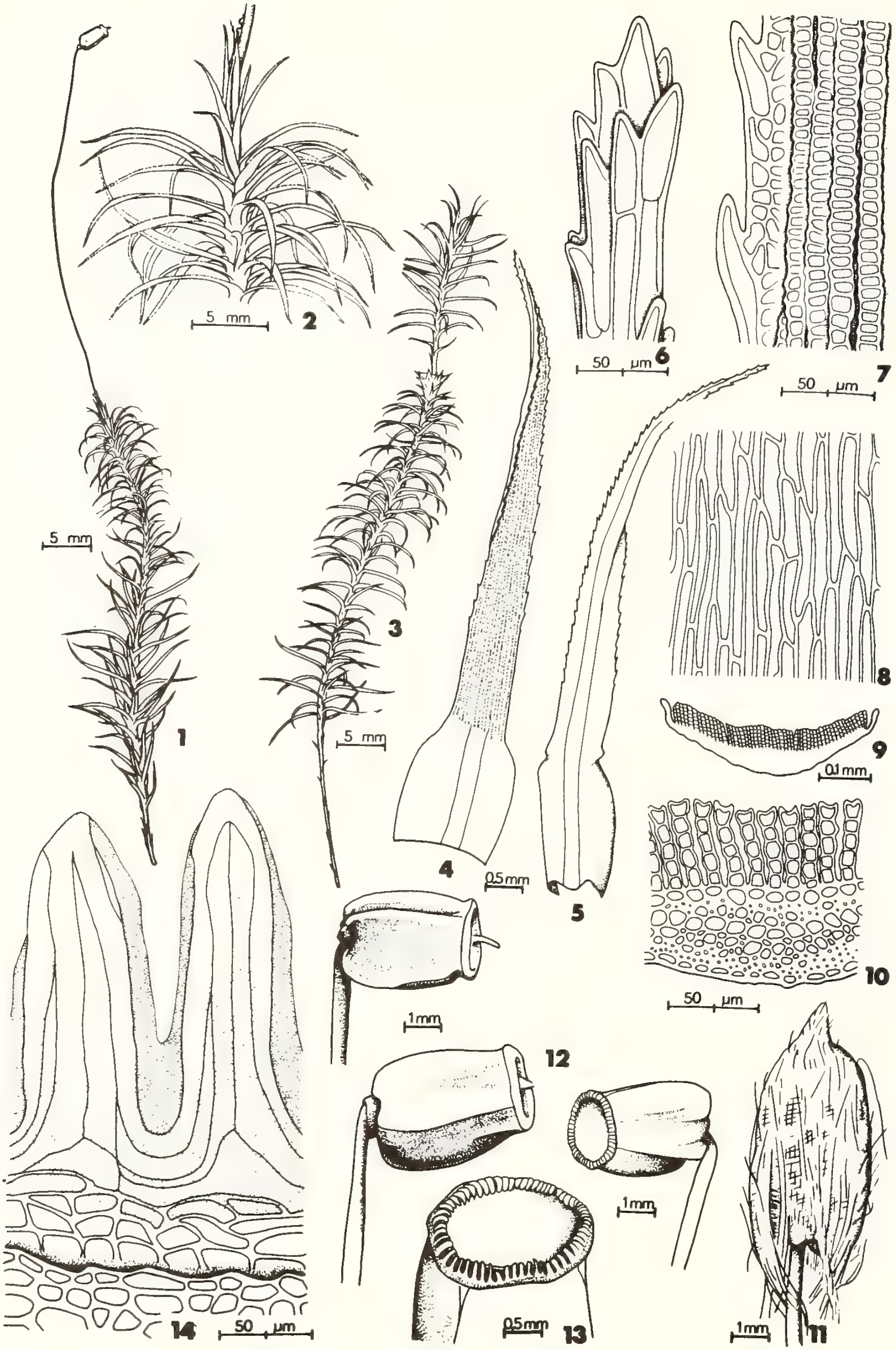
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Plate 397. *Polytrichum commune*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Leaf (ventral surface). 5. Leaf (dorsal surface). 6–8. Leaf cells (6, apical. 7, median-marginal. 8, median cells of sheath.). 9. Cross-section of leaf near middle. 10. Cross-section of portion of leaf and lamellae near middle. 11. Calyptrate capsule. 12. Capsules, operculate above (dry), below (wet), inoperculate (dry). 13. Peristome. 14. Peristome teeth.

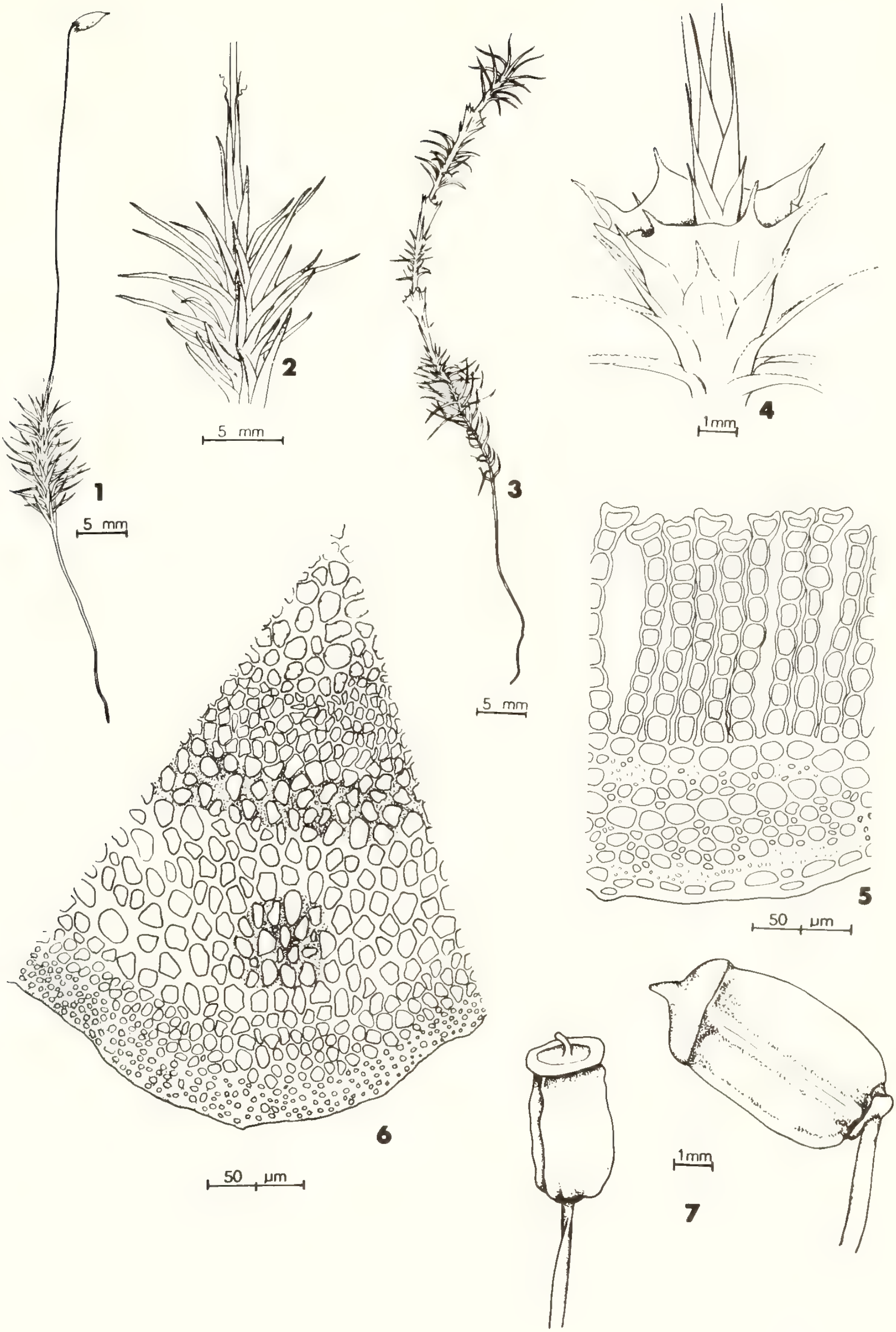
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Plate 398. *Polytrichum commune* var. *perigoniale*. 1. Habit. 2. Portion of stem. 3. Male plant. 4. Perigonial bud. 5. Cross-section of portion of leaf and lamellae near middle. 6. Cross-section of portion of stem. 7. Capsules, wet (right), dry (left).

Excluded Taxa

The following mosses have been reported for the Maritime Provinces, but either their taxonomic status is uncertain or no specimens have been seen to confirm their presence in the province(s) cited. The asterisk indicates the taxa that are neither accepted nor listed as occurring in North America by Crum, Steere, and Anderson (1973).

Aloina rigida (Hedw.) Limpr. Nova Scotia (Erskine, 1953).

Amblyodon dealbatus (Hedw.) B.S.G. New Brunswick, Nova Scotia (Macoun and Kindberg, 1892).

**Amblystegium juratzkanum* var. *serotinum* (Lindb.) Wijk & Marg. New Brunswick, Nova Scotia, Prince Edward I. (Macoun and Kindberg, 1892 as *A. porphyrhizum* (Lindb.) Schimp.).

**Amblystegium speirophyllum* Kindb. New Brunswick (Macoun and Kindberg, 1892).

Amblystegium varium var. *ovatum* (Grout) Grout. Nova Scotia (Habeeb, 1946).

Amphidium californicum (Hampe *ex* C. Müll.) Broth. Nova Scotia (Grout, 1933–40).

Andreaea crassinervia Bruch. Nova Scotia (Bartram, 1922).

Anomodon minor (Hedw.) Fürnr. New Brunswick (Macoun and Kindberg, 1892 as *A. obtusifolius* Bruch & Schimp.), Nova Scotia (Brown, 1951).

**Anomodon moseri* (Kindb.) Kindb. New Brunswick (Kindberg, 1893 as *Leskea moseri* Kindb.).

Archidium alternifolium (Hedw.) Schimp. Nova Scotia (Erskine, 1947).

Arctoa hyperborea (With.) B.S.G. Nova Scotia (Macoun, 1902 as *Dicranella cerviculatula* Kindb.).

Atrichum angustatum (Brid.) B.S.G. New Brunswick (Fowler, 1879).

Atrichum haussknechtii Jur. & Milde. Nova Scotia, Prince Edward I. (Macoun, 1902).

Atrichum selwynii Aust. New Brunswick, Nova Scotia (Macoun, 1902).

Atrichum undulatum (Hedw.) P. Beauv. New Brunswick (Fowler, 1879).

**Atrichum undulatum* var. *minus* (Hedw.) Par. Nova Scotia (Brown, 1951).

Aulacomnium palustre var. *imbricatum* B.S.G. New Brunswick (Habeeb, 1944b), Nova Scotia (Habeeb, 1946).

**Aulacomnium palustre* var. *polycephalum* (Brid.) Hüb. Prince Edward I. (Macoun and Kindberg, 1892).

Aulacomnium turgidum (Wahlenb.) Schwaegr. Nova Scotia (Erskine, 1968).

Barbula reflexa (Brid.) Brid. Nova Scotia (Erskine, 1953).

Bartramia ithyphylla Brid. New Brunswick (Grout, 1933–40).

Bartramia pomiformis var. *elongata* Turn. New Brunswick (Grout, 1933–40 as *B. pomiformis* var. *crispa* B.S.G.), Nova Scotia (Macoun, 1902 as *B. crispa* Sw.).

Brachythecium albicans (Hedw.) B.S.G. New Brunswick (Fowler, 1879).

Brachythecium erythrorrhizon B.S.G. Nova Scotia (Brown, 1951).

**Brachythecium glaciale* B.S.G. Nova Scotia (Macoun, 1902 as *Eurhynchium glaciale* B.S.G.).

**Brachythecium harpidioides* C. Müll. & Kindb. *ex* Mac. & Kindb. New Brunswick (Macoun and Kindberg, 1892).

Brachythecium reflexum var. *pacificum* Ren. & Card. *ex* Röll. New Brunswick (Habeeb, 1943 as *B. bestii* Grout), Nova Scotia (Grout, 1922).

**Brachythecium rivulare* var. *obtusulum* Kindb. *ex* Mac. & Kindb. New Brunswick (Macoun and Kindberg, 1892).

Brachythecium salebrosum var. *flaccidum* B.S.G. New Brunswick (Anonymous, 1898).

**Brachythecium starkei* ssp. *oedipodium* (Mitt.) Ren. & Card. New Brunswick (Macoun and Kindberg, 1892 as *B. oedipodium* (Mitt.) Jaeg.).

Brotherella roellii (Ren. & Card. *ex* Röll) Fleisch. Nova Scotia (Macoun, 1902 as *Rhaphidostegium roellii* Ren. & Card.).

Brotherella tenuirostris (Bruch & Schimp. *ex* Sull.) Fleisch. New Brunswick (Macoun and Kindberg, 1892 as *Rhaphidostegium cylindricarpum* (C. Müll.) Lesq. & James), Nova Scotia (Nichols, 1916 as *Sematophyllum tenuirostris* (Bruch & Schimp.) Britt.).

Bruchia sullivantii Aust. Nova Scotia (Erskine, 1950).

Bryhnia hultenii Bartr. *ex* Grout. Nova Scotia (Habeeb, 1946).

Bryum algovicum Sendtn. *ex* C. Müll. New Brunswick (Macoun and Kindberg, 1892 as *B. pendulum* Schimp.).

Bryum alpinum With. New Brunswick (Moser and Hay, 1898).

**Bryum argenteum* var. *lanatum* (P. Beauv.) Hampe. Prince Edward I. (Macoun and Kindberg, 1892).

Bryum capillare var. *torquescens* (Bruch *ex* De Not.) Husn. Nova Scotia (Macoun and Kindberg, 1892 as *B. torquescens* Bruch *ex* De Not.).

Bryum knowltonii Barnes. Nova Scotia (Macoun, 1902).

Bryum lonchocaulon C. Müll. New Brunswick (Moser and Hay, 1898 as *B. cirrhatum* Hoppe & Hornsch.), Nova Scotia (Brown, 1929 as *B. cirrhatum* Hoppe & Hornsch.).

Bryum pallens (Brid.) Sw. *ex* Röhl. New Brunswick (Habeeb, 1944a), Nova Scotia (Macoun, 1902).

**Bryum pallens* var. *alpinum* (B.S.G.) Podp. Nova Scotia (Brown, 1936b as *B. fallax* Milde).

**Bryum pallescens* var. *subrotundum* (Brid.) B.S.G. New Brunswick (Moser and Hay, 1898 as *B. subrotundum* Brid.).

Bryum turbinatum (Hedw.) Turn. Nova Scotia (Macoun and Kindberg, 1892 as *B. erythrophyllum* Kindb.).

Buxbaumia viridis (DC.) Moug & Nestl. Nova Scotia (Britton, 1896 as *B. indusiata* Brid.).

Calliergon giganteum var. *fluitans* (Klinggr.) Roth. New Brunswick, Nova Scotia (Karczmarz, 1971).

Calliergon richardsonii (Mitt.) Kindb. *ex* Warnst. New Brunswick (Habeeb, 1952), Prince Edward I. (Macoun and Kindberg, 1892 as *Hypnum richardsonii* (Mitt.) Lesq. & James).

Calliergon sarmentosum (Wahlenb.) Kindb. New Brunswick (Macoun and Kindberg, 1892 as *Hypnum sarmentosum* Wahlenb.).

**Calliergonella cuspidata* var. *pungens* (Schimp.) Latz. New Brunswick (Karczmarz, 1971).

**Calliergonella cuspidata* f. *abbreviata* (Röll) Podp. Nova Scotia (Karczmarz, 1971 as *Calliergon cuspidatum* f. *turgescens* (Wheldon) Karcz.).

**Calliergonella cuspidata* f. *brevifolium* (Sanio *ex* Warnst.) Podp. Nova Scotia (Karczmarz, 1971 as *Calliergon cuspidatum* var. *brevifolium* Sanio *ex* Warnst.).

Campylium halleri (Hedw.) Lindb. Nova Scotia (Erskine, 1968).

Campylium hispidulum var. *sommerfeltii* (Myr.) Lindb. New Brunswick (Macoun and Kindberg, 1892 as *Hypnum sommerfeltii* Myr.)

Campylium polygamum (B.S.G.) C. Jens. New Brunswick (Macoun and Kindberg, 1892 as *Hypnum polygamum* Wils.).

Campylium radicale (P. Beauv.) Grout. New Brunswick (Fowler, 1879 as *Hypnum radicale* Brid. and *H. bergenense* Aust.).

Campylium stellatum var. *arcticum* (Williams) Sav.-Ljub. Nova Scotia (Erskine, 1968 as *C. arcticum* (Williams) Broth.).

Ceratodon purpureus var. *conicus* (Hampe *ex* C. Müll.) Husn. Nova Scotia (Erskine, 1950 as *C. conicus* (Hampe) Lindb.).

Cinclidium arcticum (B.S.G.) Schimp. Nova Scotia (Crum and Anderson, 1981).

Cinclidium stygium Sw. Nova Scotia (Macoun and Kindberg, 1892).

Cinclidium subrotundum Lindb. Nova Scotia (Macoun, 1902).

Cirriphyllum cirrosum (Schwaegr. *ex* Schultes) Grout. Nova Scotia (Erskine, 1968).

Climacium americanum Brid. New Brunswick (Fowler, 1879).

Conardia compacta (C. Müll.) Robins. New Brunswick (Moser and Hay, 1898 as *Amblystegium compactum*).

Cratoneuron commutatum (Hedw.) Roth. New Brunswick (Macoun and Kindberg, 1892 as *Hypnum commutatum* Hedw.).

Cratoneuron filicinum var. *aciculinum* (C. Müll. & Kindb. *ex* Mac. & Kindb.) Grout. New Brunswick (Habeeb, 1945).

Ctenidium molluscum (Hedw.) Mitt. New Brunswick, Prince Edward I. (Macoun and Kindberg, 1892 as *Hypnum molluscum* Hedw.).

**Cynodontium polycarpum* (Hedw.) Schimp. New Brunswick (Fowler, 1879), Nova Scotia, Prince Edward I. (Macoun and Kindberg, 1892).

Desmatodon latifolius (Hedw.) Brid. Nova Scotia (Erskine, 1968).

Dichelyma falcatum (Hedw.) Myr. New Brunswick (Fowler, 1879).

Dichelyma pallescens B.S.G. Nova Scotia (Lesquereux and James, 1884).

Dicranella crispa (Hedw.) Schimp. New Brunswick (Moser and Hay, 1898).

Dicranella schreberiana (Hedw.) Schimp. New Brunswick (Habeeb, 1944a as *D. schreberi* (Hedw.) Schimp.).

Dicranodontium asperulum (Mitt.) Broth. Nova Scotia (Erskine, 1968).

Dicranodontium denudatum (Brid.) Britt. *ex* Williams. New Brunswick (Macoun and Kindberg, 1892 as *D. longirostre* Bruch & Schimp.), Nova Scotia (Macoun, 1902 as *D. longirostre* Bruch & Schimp.

Dicranum bonjeanii De Not. *ex* Lisa. New Brunswick (Fowler, 1879 as *D. undulatum* Turn.).

Dicranum elongatum Schleich. *ex* Schwaegr. Nova Scotia (Erskine, 1968).

Dicranum groenlandicum Brid. Nova Scotia (Erskine, 1968).

Dicranum majus var. *orthophyllum* A. Braun *ex* Milde. New Brunswick (Grout, 1936–39).

Dicranum muehlenbeckii B.S.G. New Brunswick (Habeeb, 1944b), Nova Scotia (Nichols, 1916).

**Dicranum scoparium* var. *nigrescens* Györf. New Brunswick (Moser and Hay, 1898).

**Dicranum scoparium* var. *orthophyllum* Brid. Nova Scotia (Brown, 1936b).

Dicranum spadiceum Zett. Nova Scotia (Erskine, 1968).

Dicranum tauricum Sapeh. New Brunswick (Macoun and Kindberg, 1892 as *D. strictum* Schleich.).

**Didymodon trifarius* (Hedw.) Röhl. Nova Scotia (Brown, 1936b as *Barbula lurida* Lindb.).

Discelium nudum (Dicks.) Brid. Nova Scotia (Brown, 1946).

Distichium inclinatum (Hedw.) B.S.G. Nova Scotia (Nichols, 1918 as *Swartzia inclinata* Ehrh.).

**Ditrichum flexicaule* f. *estellae* Hab. New Brunswick (Habeeb, 1950).

Ditrichum heteromallum (Hedw.) Britt. Nova Scotia (Macoun, 1902 as *D. homomallum* (Hedw.) Hampe).

**Drepanocladus aduncus* var. *aquaticus* (Sanio) Ren. New Brunswick (Habeeb, 1944c as *D. aduncus* f. *aquaticus* (Sanio) Mönk.), Nova Scotia (Brown, 1936b as *Hypnum aduncum* var. *aquaticum* Sanio).

Drepanocladus capillifolius (Warnst.) Warnst. Nova Scotia (Habeeb, 1946 as *D. aduncus* var. *capillifolius* (Warnst.) Wynne).

**Drepanocladus exannulatus* var. *serratus* (Milde) Loeske. Nova Scotia (Nichols, 1916 as *D. serratus* (Milde) Warnst.).

**Drepanocladus fluitans* var. *gracilis* Warnst. Nova Scotia (Brown, 1929).

**Drepanocladus fluitans* var. *jeanbernatii* (Ren.) Warnst. Nova Scotia (Brown, 1929).

**Drepanocladus fluitans* var. *submersus* (Schimp.) Loeske. Nova Scotia (Nichols, 1916 as *D. submersus* (Schimp.) Warnst.).

Drepanocladus lycopodioides (Brid.) Warnst. Nova Scotia (Erskine, 1968).

Drepanocladus revolvens (Sw.) Warnst. New Brunswick (Habeeb, 1952).

Drepanocladus sendtneri (Schimp.) Warnst. New Brunswick (Macoun and Kindberg, 1892 as *Hypnum sendtneri* Schimp.), Nova Scotia (Macoun, 1902 as *Hypnum sendtneri* Schimp.).

**Drepanocladus uncinatus* var. *alpinus* (Ren.) Warnst. Nova Scotia (Nichols, 1916 as *D. aduncus* var. *alpinus* (Ren.) Warnst.).

**Drepanocladus uncinatus* var. *gracilescens* B.S.G. Nova Scotia (Nichols, 1916 as *D. aduncus* var. *gracilescens* (Bruch & Schimp.) Warnst.).

**Drepanocladus uncinatus* var. *gracillimus* (Berggr.) Størm. Nova Scotia (Nichols, 1916 as *D. aduncus* var. *gracillimus* (Berggr.) Warnst.).

Drepanocladus uncinatus var. *plumosus* (Schimp.) Warnst. Nova Scotia (Nichols, 1916 as *D. aduncus* var. *plumosus* (Schimp.) Warnst.).

Drepanocladus uncinatus var. *plumulosus* (B.S.G.) Warnst. Nova Scotia (Brown, 1929).

Encalypta affinis Hedw. *f.* New Brunswick (Macoun and Kindberg, 1892 as *E. macounii* Aust.).

**Encalypta streptocarpa* Hedw. New Brunswick (Lawton, 1971), Nova Scotia (Erskine, 1968).

Entodon cladorrhizans (Hedw.) C. Müll. New Brunswick (Macoun and Kindberg, 1892), Nova Scotia (Brown, 1929).

**Eurhynchium crassinervium* var. *laxorete* Kindb. *ex* Mac. & Kindb. New Brunswick (Macoun and Kindberg, 1892).

Eurhynchium hians (Hedw.) Sande Lac. New Brunswick (Moser and Hay, 1898).

**Eurhynchium rusciforme* var. *complanatum* H. Schultz *ex* Limpr. Nova Scotia (Nichols, 1916 as *Oxyrrhynchium rusciforme* var. *complantum* H. Schultz).

**Eurhynchium speciosum* (Brid.) Jur. Nova Scotia (Erskine, 1947).

**Fissidens cristatus* f. *immarginatus* Hab. New Brunswick (Habeeb, 1952).

Fissidens exiguus Sull. Nova Scotia (Erskine, 1968).

Fontinalis antipyretica Hedw. New Brunswick (Macoun and Kindberg, 1892).

Fontinalis howellii Ren. & Card. Nova Scotia (Grout, 1928-34 as *F. kindbergii* Ren. & Card.).

Fontinalis neomexicana Sull. & Lesq. Nova Scotia (Macoun and Kindberg, 1892).

Fontinalis patula Card. Nova Scotia (Welch, 1960).

Fontinalis sphagnifolia (C. Müll.) Wijk & Marg. Nova Scotia (Nichols, 1916 as *F. biformis* Sull.).

Forsstroemia trichomitria (Hedw.) Lindb. Nova Scotia (Erskine, 1968 as *Leptodon trichomitrius* (Hedw.) Mohr *ex* Sull.).

Funaria flavicans Michx. Nova Scotia (Erskine, 1947).

Funaria hygrometrica var. *calvescens* (Schwaegr.) Mont. New Brunswick (Fowler, 1879).

Grimmia alpicola var. *latifolia* (Zett.) Möll. New Brunswick (Habeeb, 1944c).

* *Grimmia alpicola* var. *rivularis* f. *papillosa* G. Jones. New Brunswick (Habeeb, 1944c as *G. alpicola* var. *papillosa* (G. Jones) Hab.).

Grimmia apocarpa var. *nigrescens* Mol. Nova Scotia (Crum, 1954).

Grimmia apocarpa var. *pulvinata* (Hedw.) G. Jones. New Brunswick (Macoun, 1902 as *G. subflaccida* Kindb.).

Grimmia pilifera P. Beauv. Nova Scotia (Grout, 1933–40).

Gymnostomum calcareum Nees, Hornsch. & Sturm. Nova Scotia (Brown, 1936b as *Weissia calcarea* (C. Müll.) Nees & Hornsch.).

Gymnostomum recurvirostrum var. *commutatum* (Mitt.) Grout. Nova Scotia (Grout, 1936–39).

Gyroweisia tenuis (Hedw.) Schimp. Nova Scotia (Brown, 1936b as *Weissia tenuis* C. Müll.).

* *Hedwigia ciliata* f. *viridis* (B.S.G.) G. Jones. Nova Scotia (Macoun and Kindberg, 1892 as *H. ciliata* var. *viridis* Schimp.).

Helodium paludosum (Sull.) Aust. Nova Scotia (Erskine, 1968).

Herzogiella seligeri (Brid.) Iwats. New Brunswick (Macoun and Kindberg, 1892 as *Plagiothecium silesiacum* (Selig.) Schimp.), Nova Scotia (Erskine, 1968 as *Plagiothecium seligeri* (Brid.) Lindb.).

Heterophyllium affine (Hook.) Fleisch. New Brunswick (Moser and Hay, 1898 as *Hypnum nemorosum* Koch).

Homalotheciella subcapillata (Hedw.) Broth. Nova Scotia (Erskine, 1968).

Hygroamblystegium noterophilum (Sull. & Lesq. *ex* Sull.) Warnst. Nova Scotia (Erskine, 1968).

Hygrohypnum alpestre (Hedw.) Loeske. Nova Scotia (Nichols, 1916).

Hygrohypnum molle (Hedw.) Loeske. New Brunswick (Habeeb, 1952), Nova Scotia (Erskine, 1968).

Hygrohypnum polare (Lindb.) Loeske. Nova Scotia (Erskine, 1968).

Hygrohypnum smithii (Sw. *ex* Lilj.) Broth. Nova Scotia (Nichols, 1916).

Hygrohypnum subeugyrium (Ren. & Card.) Broth. New Brunswick (Macoun, 1902).

Hypnum bambergeri Schimp. Nova Scotia (Erskine, 1968).

Hypnum callichroum Funck *ex* Brid. New Brunswick (Moser and Hay, 1898), Nova Scotia (Lesquereux and James, 1884).

Hypnum cupressiforme Hedw. New Brunswick (Macoun and Kindberg, 1892 as *H. complexum* Lesq. & James).

Hypnum cupressiforme var. *resupinatum* (Wils.) Schimp. New Brunswick (Macoun, 1902 as *H. pseudo-nemorosum* Kindb.).

Hypnum dieckii Ren. & Card. *ex* Röll. Nova Scotia (Macoun and Kindberg, 1892 as *H. canadense* Kindb.).

Hypnum hamulosum B.S.G. Nova Scotia (Erskine, 1968).

Hypnum pratense Koch *ex* Brid. Nova Scotia (Nichols, 1916 as *Stereodon pratensis* (Koch) Warnst.).

Hypnum recurvatum (Lindb. & H. Arnell) Kindb. Nova Scotia (Macoun, 1902 as *H. fastigiatum* Brid.).

Hypnum revolutum (Mitt.) Lindb. Nova Scotia (Erskine, 1968).

Hypnum subimponens Lesq. New Brunswick (Macoun and Kindberg, 1892).

* *Hypnum uncinulatum* Jur. Nova Scotia (Brown, 1936b as *H. canariense* Mitt.).

Hypnum vaucheri Lesq. Nova Scotia (Erskine, 1953).

Isothecium stoloniferum Brid. Nova Scotia (Brown, 1929 as *Eurhynchium stoloniferum* (Hook.) Jaeg. & Sauerb.).

* *Leptodictyum riparium* var. *abbreviatum* (B.S.G.) Grout. Nova Scotia (Brown, 1951 as *L. riparium* f. *abbreviatum* (Bruch & Schimp.) Grout).

* *Leptodictyum riparium* var. *longifolium* (Schultz) Warnst. Nova Scotia (Brown, 1951 as *L. riparium* f. *longifolium* (Schultz) Grout).

Leptodictyum vacillans (Sull.) Broth. Nova Scotia (Nichols, 1916 as *Amblystegium vacillans* Sull.)

Leptodontium excelsum (Sull.) Britt. Nova Scotia (Macoun, 1902 as *Amphoridium sullivantii* Lesq. & James).

Lescuraea incurvata (Hedw.) Lawt. Nova Scotia (Erskine, 1953 as *Pseudoleskea atrovirens* B.S.G.).

Leskea gracilescens Hedw. Nova Scotia (Brown, 1936b).

Leskea obscura Hedw. New Brunswick (Macoun, 1902), Nova Scotia (Brown, 1929).

Leucodon julaceus (Hedw.) Sull. New Brunswick (Fowler, 1879).

Meesia longiseta Hedw. New Brunswick (Macoun and Kindberg, 1892), Nova Scotia (Erskine, 1968 as *M. hexasticha* (Funck) Mönk.).

Micromitrium austinii Aust. Nova Scotia (Erskine, 1950 as *Nanomitrium austinii* (Sull.) Lindb.).

Mnium thomsonii Schimp. New Brunswick (Fowler, 1879 as *M. orthorrhynchum* C. Müll.), Nova Scotia (Macoun and Kindberg, 1892 as *M. orthorrhynchum* C. Müll.).

Myrinia pulvinata (Wahlenb.) Schimp. New Brunswick (Macoun, 1902 as *Leskea pulvinata* Wahlenb.).

Myurella sibirica var. *tenella* (Hab.) Crum, Steere & Anders. New Brunswick (Habeeb, 1952 as *M. careyana* var. *tenella* Hab.).

Neckera pennata var. *tenera* C. Müll. New Brunswick (Habeeb, 1944b as *N. pennata* var. *oligocarpa* (Bruch) Grout), Prince Edward I. (Macoun and Kindberg, 1892 as *N. oligocarpa* Bruch & Schimp.).

Oncophorus virens (Hedw.) Brid. Nova Scotia (Lawton, 1971).

Oncophorus virens var. *serratus* (B.S.G.) Braithw. New Brunswick (Habeeb, 1945).

Orthotrichum affine Brid. New Brunswick (Fowler, 1880), Nova Scotia (Macoun, 1902), Prince Edward I. (Macoun and Kindberg, 1892).

**Orthotrichum affine* var. *fastigiatum* (Brid.) Hüb. Nova Scotia (Macoun, 1902 as *O. affine* ssp. *fastigiatum* Bruch).

Orthotrichum pumilum Sw. Nova Scotia (Erskine, 1968).

Orthotrichum pylaisii Brid. New Brunswick (Habeeb, 1952 as *O. microblephare* Schimp.).

**Orthotrichum rogeri* Brid. New Brunswick (Fowler, 1879).

Orthotrichum rupestre Schleich. *ex* Schwaegr. Nova Scotia (Macoun, 1902).

Orthotrichum strangulatum P. Beauv. New Brunswick (Fowler, 1879), Nova Scotia, Prince Edward I. (Macoun and Kindberg, 1892).

Orthotrichum striatum Hedw. New Brunswick (Fowler, 1879 as *O. leiocarpum* Bruch & Schimp.).

Paraleucobryum sauteri (B.S.G.) Loeske. New Brunswick (Macoun, 1902 as *Dicranum subulifolium* Kindb.).

**Philonotis fontana* var. *seriata* f. *occidentalis* Flow. Nova Scotia (Grout, 1933–40).

Philonotis marchica (Hedw.) Brid. New Brunswick (Fowler, 1879 as *Bartramia marchica* Brid.).

**Philonotis marchica* var. *laxa* (Limpr.) Loeske & Warnst. New Brunswick (Möller, 1924).

Philonotis muhlenbergii (Schwaegr.) Brid. New Brunswick (Macoun, 1902).

Plagiomnium insigne (Mitt.) Kop. Prince Edward I. (Barnes, 1896 as *Mnium insigne intermedium* Kindb.).

Plagiomnium rostratum (Schrad.) Kop. Nova Scotia (Brown, 1951 as *Mnium rostratum* Schrad.).

**Plagiopus oederiana* var. *alpinus* (Schwaegr.) Torre & Sarnth. New Brunswick (Habeeb, 1950 as *P. oederi* f. *alpinus* (Schwaegr.) Hab.).

Plagiothecium piliferum (Sw. *ex* C.J. Hartm.) B.S.G. Nova Scotia (Erskine, 1968).

**Plagiothecium platyphyllum* Mönk. Nova Scotia (Tuomikoski, Koponen & Ahti, 1973).

Platydictya minutissimum (Sull. & Lesq. *ex* Sull.) Crum. Nova Scotia (Erskine, 1968 as *Amblystegiella minutissima* (Sull. & Lesq. *ex* Sull.) Nichols).

Pogonatum alpinum var. *septentrionale* (Brid.) Brid. Nova Scotia (Lawton, 1971).

Pohlia carnea (Turn.) Lindb. Nova Scotia, Prince Edward I. (Macoun and Kindberg, 1892 as *Webera carnea* Schimp.).

Pohlia longicolla (Hedw.) Lindb. New Brunswick (Habeeb, 1952).

**Pohlia minor* Schleich. *ex* Schwaegr. New Brunswick (Fowler, 1879 as *Bryum acuminatum* Hoppe & Hornsch.).

Pohlia schleicheri Crum. Nova Scotia (Erskine, 1968 as *P. gracilis* (Schleich.) Lindb.).

Polytrichum hyperboreum R. Br. Nova Scotia (Erskine, 1968 as *P. piliferum* var. *hyperboreum* (R. Br.) C. Müll.).

Pottia truncata (Hedw.) Fürnr. *ex* B.S.G. New Brunswick (Habeeb, 1944a).

Pseudephemerum nitidum (Hedw.) Loeske. Nova Scotia (Erskine, 1947 as *Pleuridium axillare* Lindb.).

**Pterigynandrum filiforme* f. *majus* (De Not.) De Not. Nova Scotia (Macoun, 1902 as *P. filiforme* ssp. *decipiens* (Web. & Mohr) Limpr.).

Pylaisiella polyantha (Hedw.) Grout. Prince Edward I. (Macoun and Kindberg, 1892 as *Pylaisia polyantha* Bruch & Schimp.).

Rhacomitrium heterostichum var. *macounii* (Kindb. *ex* Mac.) G. Jones. Nova Scotia (Macoun, 1902 as *R. robustifolium* Kindb.).

Rhacomitrium sudeticum (Funck) B.S.G. New Brunswick (Habeeb, 1952 as *R. heterostichum* var. *sudeticum* (Funck) Jones).

**Rhacomitrium sudeticum* var. *validius* Jur. Nova Scotia (Brown, 1936a).

**Rhacomitrium sudeticum* f. *alpinum* Lawt. Nova Scotia (Lawton, 1971).

Rhizomnium pseudopunctatum (Bruch & Schimp.) Kop. Nova Scotia (Brown, 1929 as *Mnium subglobosum* Bruch & Schimp.).

Rhodobryum roseum (Hedw.) Limpr. New Brunswick (Macoun and Kindberg, 1892 as *Bryum roseum* Schreb.), Nova Scotia (Brown, 1936b).

**Rhynchostegium confertum* (Dicks.) B.S.G. Nova Scotia (Brown, 1951 as *Eurhynchium confertum* Milde).

**Rhynchostegium murale* (Hedw.) B.S.G. Nova Scotia (Brown, 1951 as *Eurhynchium murale* Milde).

Rhynchostegium serrulatum (Hedw.) Jaeg. & Sauerb. New Brunswick (Fowler, 1879 as *Hypnum serrulatum* Hedw.), Nova Scotia (Erskine, 1947 as *Eurhynchium serrulatum* (Hedw.) Kindb.).

Rhytidiadelphus squarrosus (Hedw.) Warnst. New Brunswick (Moser and Hay, 1898 as *Hypnum squarrosum* L.), Nova Scotia (Macoun and Kindberg, 1892 as *Hylocomium squarrosum* (L.) Schimp.).

Schwetschkeopsis fabronia (Schwaegr.) Broth. New Brunswick (Macoun and Kindberg, 1892 as *Leskea denticulata* Sull.).

Scleropodium cespitans var. *sublaeve* (Ren. & Card.) Wijk & Marg. Nova Scotia (Brown, 1951 as *S. caespitosum* var. *sublaeve* Ren. & Card.).

Scleropodium obtusifolium (Jaeg. & Sauerb.) Kindb. *ex* Mac. & Kindb. Nova Scotia (Erskine, 1968).

Scleropodium tourettei (Brid.) L. Koch. New Brunswick (Moser and Hay, 1898 as *S. illecebrum* Bruch & Schimp.).

Scorpidium turgescens (T. Jens.) Loeske. Nova Scotia (Erskine, 1968 as *Calliergon turgescens* (Schimp.) Kindb.).

Seligeria pusilla (Hedw.) B.S.G. Nova Scotia (Erskine, 1947).

Seligeria recurvata (Hedw.) B.S.G. Nova Scotia (Erskine, 1968).

Sematophyllum demissum (Wils.) Mitt. New Brunswick (Macoun and Kindberg, 1892 as *Rhaphidostegium demissum* (Wils.) Lesq. & James).

**Sphagnum aquatile* var. *sanguinale* Warnst. Nova Scotia (Warnstorf, 1911).

**Sphagnum compactum* var. *brachycladum* (Röll) Röll. New Brunswick, Prince Edward I. (Macoun and Kindberg, 1892 as *S. compactum* var. *subsquarrosum* Warnst.).

**Sphagnum cuspidatum* var. *plumulosum* Schimp. New Brunswick, Nova Scotia (Warnstorf, 1911).

**Sphagnum cuspidatum* var. *submersum* Schimp. Prince Edward I. (Macoun and Kindberg, 1892).

Sphagnum cyclophyllum Sull. & Lesq. *ex* Sull. Nova Scotia (Damman and Dowhan, 1981).

**Sphagnum fimbriatum* var. *tenue* Grav. *ex* Röll. New Brunswick, Prince Edward I. (Macoun and Kindberg, 1892).

**Sphagnum flexuosum* Dozy & Molk. Nova Scotia (Macoun and Kindberg, 1892 as *S. recurvum* var. *amblyphyllum* Russ.).

**Sphagnum fuscum* f. *fuscescens* Warnst. New Brunswick, Prince Edward I. (Macoun and Kindberg, 1892 as *S. fuscum* var. *fuscescens* Warnst.).

**Sphagnum imbricatum* var. *affine* (Ren. & Card.) Warnst. New Brunswick, Nova Scotia (Macoun and Kindberg, 1892).

**Sphagnum magellanicum* var. *roseum* (Röll) C. Jens. New Brunswick (Macoun and Kindberg, 1892 as *S. medium* var. *roseum* Warnst.).

Sphagnum molle Sull. Nova Scotia (Macoun, 1902).

**Sphagnum nemoreum* var. *elegans* (Braithw.) Wijk & Marg. New Brunswick (Moser and Hay, 1898 as *S. acutifolium* var. *rubrum*).

**Sphagnum nemoreum* f. *versicolor* Podp. New Brunswick (Macoun and Kindberg, 1892 as *S. acutifolium* var. *versicolor* Warnst.).

**Sphagnum pylaesii* var. *prostratum* (Brid.) Card. Nova Scotia (Brown, 1929 as *S. pylaesii* var. *sedoides* Lindb.).

* *Sphagnum rubellum* var. *rubrum* (Grav.) Horr. New Brunswick (Macoun, 1902 as *S. tenellum* var. *rubrum* Warnst.).

* *Sphagnum rubellum* var. *violaceum* C. Jens. New Brunswick (Macoun and Kindberg, 1892 as *S. tenellum* var. *violaceum* Warnst.).

* *Sphagnum russowii* var. *rhodochroum* Russ. *ex* Warnst. New Brunswick (Macoun and Kindberg, 1892).

* *Sphagnum squarrosum* var. *cuspidatum* Warnst. New Brunswick (Macoun and Kindberg, 1892 as *S. squarrosum* var. *semisquarrosum* Russ.).

* *Sphagnum squarrosum* var. *immersum* Beck *ex* Warnst. New Brunswick (Macoun and Kindberg, 1892 as *S. squarrosum* var. *spectabile* Russ.).

Sphagnum subfulvum Sjörs. New Brunswick, Nova Scotia (Maass, 1967).

Sphagnum subnitens Russ. & Warnst. *ex* Warnst. Nova Scotia (Barnes, 1896).

Sphagnum subsecundum var. *rufescens* (Nees, Hornsch. & Sturm) Hüb. Nova Scotia (Macoun and Kindberg, 1892 as *S. rufescens* Bry. Germ.).

Sphagnum tenerum Sull. & Lesq. *ex* Sull. Nova Scotia (Ireland *et al*, 1980).

Splachnum pennsylvanicum (Brid.) Grout *ex* Crum. Nova Scotia (Macoun and Kindberg, 1892 as *Tetraplodon australis* Sull & Lesq.).

Splachnum sphaericum Hedw. New Brunswick (Lawton, 1971).

Stokesiella praelonga (Hedw.) Robins. New Brunswick (Macoun and Kindberg, 1892 as *Eurhynchium praelongum* (Hedw.) B.S.G.), Nova Scotia (Nichols, 1916 as *Oxyrrhynchium praelongum* (Hedw.) Warnst.).

Stokesiella praelonga var. *stokesii* (Turn.) Crum. New Brunswick (Habeeb, 1952 as *Eurhynchium stokesii* (Turn.) B.S.G.).

Taxiphyllum deplanatum (Bruch & Schimp. *ex* Sull.) Fleisch. Nova Scotia (Macoun and Kindberg, 1892 as *Rhynchostegium deplanatum* Schimp.).

* *Tayloria serrata* var. *tenuis* (With.) B.S.G. New Brunswick, Nova Scotia (Macoun and Kindberg, 1892 as *T. tenuis* Schimp.).

Thuidium delicatulum var. *radicans* (Kindb.) Crum, Steere & Anders. Nova Scotia (Macoun, 1902 as *T. philiberti* Limpr.).

* *Thuidium delicatulum* var. *repens* Kindb. New Brunswick (Macoun, 1902).

Thuidium minutulum (Hedw.) B.S.G. Nova Scotia (Erskine, 1968).

Thuidium scitum (P. Beauv.) Aust. Nova Scotia (Brown, 1951).

Thuidium tamariscinum (Hedw.) B.S.G. New Brunswick (Fowler, 1879 as *Hypnum tamariscinum* Hedw.).

Timmia megapolitana Hedw. New Brunswick (Habeeb, 1944b as *T. megapolitana* f. *cucullata* (Rich.) Grout).

Tomenthypnum falcifolium (Ren. *ex* Nich.) Tuom. New Brunswick (Habeeb, 1952 as *Camptothecium nitens* var. *falcifolium* Ren. *ex* Nich.).

Trichodon cylindricus (Hedw.) Schimp. Nova Scotia (Macoun, 1902).

Ulota crispa var. *intermedia* (Schimp.) Card. Nova Scotia (Macoun, 1902 as *U. intermedia* Schimp.).

Ulota crispula Bruch *ex* Brid. New Brunswick (Fowler, 1879 as *Orthotrichum crispulum* Hornsch.), Nova Scotia (Macoun and Kindberg, 1892).

Ulota curvifolia (Wahlenb.) Lilj. Nova Scotia (Vitt, 1973b).

Ulota drummondii Hook. & Grev. *ex* Grev.) Brid. Nova Scotia (Macoun, 1902).

Zygodon viridissimus var. *rupestris* Lindb. *ex* C.J. Hartm. Nova Scotia (Erskine, 1947).

Symbols and Abbreviations

* – Preceeding a locality listed under the Range for each moss indicates a literature report.
± – More or less.
ACAD – Herbarium of Acadia University.
ca. – about, approximately.
cf. – compare.
CANM – Bryophyte Herbarium of National Museums of Canada.
cm – centimeter
f. – form (when following a species name).
FH – Farlow Herbarium, Harvard University.
km – kilometer.
mm – millimeter.
n – haploid (see Glossary).
2n – diploid (see Glossary).
NSPM – Herbarium of Nova Scotia Provincial Museum.
NY — Herbarium of New York Botanical Garden.
sp. (pl. spp.) – species.
ssp. – subspecies.
μm – micrometer; one-thousandth of a millimeter.
var. – variety.
6:1 — 6 times as long as wide.

Glossary

Most of the definitions have been taken from Crum (1976). The figure numbers refer to the illustrations at the end of the glossary.

A- – a prefix, meaning not, without.
Abaxial – away from the stem or axis, opposed to *adaxial*; (see also *dorsal*). (Fig. 40)
Acaulescent – stemless or apparently so, e.g., *Ephemerum*.
Acicular – needle-like. (Fig. 63)
Acidophile – a plant of acid habitats, an *oxylophile*.
Acrocarpous – producing the sporophyte at the end of a stem or main branch (opposed to *pleurocarpous*). Acrocarpous mosses generally grow erect in tufts (rather than mats) and are sparsely branched. (Fig. 1)
Acumen (pl. Acumens or Acumina) – a slender tapering point.
Acuminate – slenderly tapered. (Fig. 74)
Acute – sharply pointed (less than 90°). (Fig. 75)
Adaxial – toward the stem or axis, opposed to *abaxial*; (see also *ventral*). (Fig. 40)
Adherent – sticking to another organ, as opposed to *coherent*, or sticking to an organ of the same kind.
Adnate – fused with or attached to another organ.
Adventive – a plant that is introduced often accidentally and imperfectly naturalized; not native.
Aeruginose – bluish-green, the colour of copper rust (verdigris).
Aggregate – clustered; often applied to sporophytes, e.g., AGGREGATE SPOROPHYTES – several sporophytes per perichaetium. (Fig. 185)
Alar cells – cells at the basal angles of a leaf, often differentiated in shape, size or colour. (Fig. 43)
Alveolate – with depressions on the surface, sometimes applied to spores. (Fig. 165)
Amorphous – without definite shape.
Amphithecium – an embryonic tissue of a developing capsule, surrounding the central *endothecium*.
Amplexicaul – clasping the stem. (Fig. 21)
Androecium – the male inflorescence. (Fig. 178)
Androgynous – male and female sex organs in the same inflorescence.
Anisophyllous – in *Sphagnum*, stem and branch leaves morphologically different.
Anisosporous – producing spores of two overlapping size classes in the same capsule (sometimes associated with asexual dimorphism); differentiated from the heterosporous condition of higher plants in which the microspores and megaspores are of two distinct sizes and are produced in different structures.
Annotinous – in yearly growths (the junction with the previous year's growth evident because of crowded leaves or other signs of interrupted growth). (Fig. 16)
Annular – ring-like.
Annulus (pl. Annuli) – a ring of differentiated cells between the mouth of the capsule and the operculum, aiding in dehiscence. (Fig. 221)
Antheridium (pl. Antheridia) – the male reproductive organ, a globose to cylindric, stalked structure producing sperms (*antherozoids*). (Fig. 179)
Antrorse – directed forward or (in reference to papillae) toward the leaf tip.
Apiculate – abruptly short-pointed (*mucronate* is even shorter; *cuspidate* is longer and stouter). (Fig. 81)
Apiculus – a short, abrupt point. (Fig. 81)
Apophysis – a swelling or expansion at the base of the capsule (also called *hypophysis*). (Fig. 207, 208)
Appendiculate – with short, transverse projections, usually referring to cilia of endostome. (Fig. 229)
Appressed – lying close together; closely applied to the stem. (Fig. 18)
Approximate – close together.
Arboreal – growing on trees.
Archegonium (pl. Archegonia) – the female reproductive organ, a flask-shaped structure producing an egg. (Fig. 182)
Arcuate – curved like a bow. (Fig. 199)
Arenicolous – growing on sand.
Areolae – small, angular areas forming a network.
Areolation – the cellular network of a leaf.
Aristate – bristle-pointed, ending in an awn (*arista*). (Fig. 72)
Articulate – with thickened joints, jointed, usually referring to exostome. (Fig. 228).
Ascending – directed upward.
Asexual – involving no sexual action; also possessing neither male nor female organs.
Astomous – without an operculum, hence indehiscent; also called *cleistocarpous*. (Fig. 213)
Attenuate – narrowly tapered. (Fig. 6)
Auricle – a small, ear-like bulge or lobe at the basal margins of a leaf. (Fig. 107)
Auriculate – with basal auricles. (Fig. 107)
Autoicous (or Autoecious) – with archegonia and antheridia in separate inflorescences on the same plant (see *cladautoicous, gonioautoicous, pseudautoicous* and *rhizautoicous*). (Fig. 170, 171)
Awn – a bristle- or hair-point, usually formed by an excurrent costa. (Fig. 72)
Axil – the upper angle between leaf and stem. (Fig. 40)
Axillary – in the leaf axils.

Basal Membrane – a delicate but often well-developed membrane at the base of the inner peristome of many mosses, commonly terminating in segments and cilia. (Fig. 223)
Beak – the prolonged apex of an operculum; also called a *rostrum*. (Fig. 205)
Bi- – a prefix meaning two.
Bicostate – with two nerves or costae. (Fig. 47)
Bicrurous – with two divisions (or "legs").
Bifarious – in two rows.
Bifid (or Bifurcate) – forked, divided into two parts. (Fig. 230)
Bigeminate – doubly paired in 4's. (Fig. 220)
Bilobed – with two lobes. (Fig. 65)
Binate – in pairs.
Bipartite – in two parts.
Bipinnate – twice-pinnately branched. (Fig. 5)
Biseriate – in two layers.
Bloom – a covering or waxy material causing a whitish or bluish overcast; see also *glaucous*.
Bog – a waterlogged open type of vegetation poor in mineral nutrition because all water is derived from precipitation, rather than from the soil; often used in this work and elsewhere for *poor fens* (which see). A bog is usually dominated by *Sphagnum*.
Bordered – having margins differentiated from the rest of the leaf in shape, size, colour, or thickness of cells (Fig. 42)
Boreal – northern, especially referring to the boreal coniferous forest which extends around the Northern Hemisphere, from the treeless tundra to temperate latitudes (and deciduous forests).
Bracts – specialized leaves surrounding reproductive organs. (Fig. 178, 181)
Brood Bodies – reduced buds, leaves (*propagula*) or branches (*brood branchlets*) (Fig. 168) or small, globose, ellipsoidal, or cylindric to filamentous, septate bodies (*gemmae*) serving in vegetative reproduction. (Fig. 169)

Bryaceous (or Bryoid) Peristome – like a *Bryum*, i.e., a "perfect" double peristome, with 16 lanceolate teeth, papillose throughout, trabeculate at back, and a well-developed endostome consisting of a high basal membrane and 16 lanceolate, keeled segments alternating with one or more cilia. (Fig. 223, 226)

Bulbiform – bulb-shaped. (Fig. 33)

Bulbil – a small, reduced bulb-shaped bud, usually axillary, serving in vegetative reproduction, e.g. *Pohlia andalusica*.

Caducous – deciduous, regularly falling off.

Caesious – bluish or bluish-glaucous.

Caespitose – tufted, growing in cushions or sods.

Calcareous – containing calcium carbonate; limestone or dolomite rocks.

Calcicolous – living in calcareous habitats.

Calciphile – a plant of calcareous habitats; opposed to *calciphobe* (*calcifuge*), a plant not occupying calcareous habitats.

Callose – hard and thick.

Calyptra (pl. Calyptrae) – a membranous hood over the developing sporophyte, developed from the archegonium, in true mosses ruptured near the base, carried upward on the elongation of the seta, and continuing growth to form a cap over the capsule. (Fig. 191–194)

Campanulate – bell-shaped. (Fig. 214)

Canaliculate – channelled. (Fig. 106)

Canescent – hoary because of hyaline hair-points on the leaves.

Capillary – hair-like.

Capitate (or Capitulate) – rounded and compact forming a head-like *capitulum* (e.g., *Sphagnum*).

Capsule – the spore case, often differentiated into an upper spore-bearing *urn* or *theca* and a sterile basal portion called the *neck* (which may be considerably differentiated as a broad *apophysis* or *hypophysis*). (Fig. 195)

Carinate – keeled like the bottom of a boat. (Fig. 104)

Cartilaginous – firm and tough.

Castaneous – chestnut-brown.

Catenulate – chain-like. (Fig. 20)

Caulescent – having a stem.

Caulid – haploid stem of bryophyte.

Cauline – referring to the stem.

Central strand – a small group of elongate cells forming a central axis of some stems. (Fig. 150)

Cernuous – nodding or drooping. (Fig. 219)

Chartaceous – papery.

Chlorocysts – small, elongate, green cells forming a network enclosing the large, hyaline cells (*leucocysts*) of a *Sphagnum* leaf, also called *green cells* or *chlorophyll cells*; also applied to small, green cells enclosed by layers of hyaline cells in the leaves of Leucobryaceae or mingled with them in *Paraleucobryum*. (Fig. 151, 152)

Chlorophyllose – green, containing chlorophyll.

Cilia (sing. Cilium) – delicate, thread-like structures alternating with the segments of the inner peristome of many mosses; also applied to hair-like appendages fringing leaves or calyptrae. (Fig. 223)

Ciliate – fringed with hairy appendages. (Fig. 100)

Cinereous – ashy-gray.

Circinate – curved in a circle. (Fig. 70)

Circumboreal – widespread in the Northern Hemisphere, circumpolar.

Cirrate (or Cirrose) – curled. (Fig. 112)

Cladautoicous – with the male inflorescence on a separate branch. (Fig. 171)

Cladocarpous – producing the sporophyte at the end of a special, short branch. (Fig. 3)

Clavate (or Claviform) – slender, elongate, and thickened upward, club-like. (Fig. 62)

Cleistocarpous – lacking an operculum and hence irregularly dehiscent (opposed to *stegocarpous*). (Fig. 213)

Coalesced – fused together.

Coarctate – pressed together, squeezed in, constricted, sometimes applied to strangulate capsules (e.g., *Orthotrichum*). (Fig. 209)

Cochleariform – round and deeply concave, shaped like the bowl of a spoon (not snail-like or spiraled as the derivation would suggest). (Fig. 54)

Coherent (or Cohering) – sticking together, sticking to another organ of the same kind.

Collenchymatous – with cell walls thickened at the corners; in liverworts such thickenings are called *trigones*. (Fig. 140)

Collum – the tapered base or *neck* of a capsule. (Fig. 195)

Columella – the central axis of a capsule around which the spores develop. (Fig. 198, 212)

Comb-fibril – a ridge-like growth on the branch leaf hyaline cell walls adjacent to the chlorophyllose cells. (Fig. 156, 157)

Commissure – margin; in branch leaves of *Sphagnum*, the "seam" formed by the adjacent walls of hyaline and green cells; hence, pores along the commissures are arranged along the lateral margins of hyaline cells.

Comose – hairy, but used by bryologists to refer to leaves larger and more crowded, forming a tuft or *coma* at the stem tip; extremely comose stems may be *rosulate* in appearance.

Complanate – flattened together or compressed in one plane. (Fig. 24)

Complicate – folded lengthwise. (Fig. 102)

Complicate-Carinate – sharply folded along a keel. (Fig. 103)

Compressed – flattened.

Concolorous – of the same colour.

Conduplicate – strongly folded along the middle. (Fig. 101)

Confluent – merging. (Fig. 23)

Connate – fused, joined together.

Connivent – approaching or meeting at the tips, directed to a single point, converging.

Constricted – abruptly narrowed. (Fig. 209)

Contorted – bent into irregular curves, irregularly twisted. (Fig. 112)

Cordate – heart-shaped. (Fig. 47)

Coriaceous – tough, leathery.

Cortex – differentiated outer layers of a stem or branch, surrounding a central cylinder. (Fig. 150)

Cortical – referring to the outer cells of stems or branches.

Corticolous – growing on bark.

Cosmopolitan – occurring in all major floristic zones of the world.

Costa (pl. Costae) – nerve of a leaf, sometimes double, sometimes single forming a midrib. (Fig. 42)

Costate – with a costa.

Crenate – with rounded teeth. (Fig. 122)

Crenulate – with minute, rounded teeth.

Cribrose – finely perforated, sieve-like. (Fig. 232)

Crisped (or Crispate) – wavy (like crisp bacon); often used more loosely to mean variously curled, twisted and contorted. (Fig. 112)

Cryptopore – having *immersed* stomata, with the guard cells sunken below the level of the exothecial cells and often ± covered by them (opposed to *phaneropore*). (Fig. 126)

Cucullate – hooded or hood-shaped; a *cucullate* calyptra is conic and split up one side, resembling a monk's hood (Fig. 192); also used to describe leaves concave at the tips (Fig. 109). A *mitrate* calyptra may be entire at base or several-lobed.

Cultriform – shaped like a knife, in bryology meaning curved and asymmetric, like a short, broad scimitar (apparently an incorrect form resulting from a confusion with *cultiform*, or shaped like a ploughshare). (Fig. 61)

Cuneate – wedge-shaped, cuneiform.

Cupulate – cup-shaped, rounded and swollen. (Fig. 215)

Cushion – with stems ± erect but somewhat radiating to form small hemispherical tufts (as in *Orthotrichum*).

Cuspidate – ending abruptly in a stout, rigid point. (Fig. 82)

Cuticle – the non-cellular covering of such organs as leaves or capsules, often variously roughened; epidermal cells of stems are sometimes referred to as *cuticular* or *cortical* cells.

Cyathiform – cup-shaped. (Fig. 215)
Cygneous – curved downward like a swan's neck. (Fig. 184)
Cymbiform – concave and broadly boat-shaped. (Fig. 44)

Deciduous – falling off.
Decumbent – ascending from a prostrate base, lying prostrate but with ascending tips.
Decurrent – with the margins extending down the stem below the leaf insertion as ridges or narrow wings. (Fig. 108)
Decurved – curved downward. (Fig. 11)
Deflexed – bent or curved downward. (Fig. 90)
Defoliate – denunded of leaves.
Dehiscent – splitting open, referring to capsules opening by valves or by an operculum, or irregularly.
Deltoid – equilaterally triangular. (Fig. 45, 155)
Dendroid – branched above a trunk-like base and resembling a tree (e.g., *Climacium*). (Fig. 28)
Dentate – with sharp teeth directed outward. (Fig. 116)
Denticulate – finely dentate. (Fig. 115)
Denuded (or Denudate) – with leaves worn off.
Depauperate – poorly developed.
Depressed – flattened, low.
Descending – directed downward.
Dextrorse – twisted to the right (opposed to *sinistrorse*).
Diaphanous – transparent.
Diaspore – any agent which moves reproductive germ plasm from one place to another.
Dichotomous – equally forked, with paired branches. (Fig. 14)
Dimidiate – split on one side (cucullate calyptrae are dimidiate and hooded). (Fig. 191)
Dimorphous – of two forms.
Dioicous (or Dioecious) – with archegonia and antheridia on separate plants. (Fig. 176, 177)
Discoid (or Disciform) – flattened and disc-like or plate-like (Fig. 183); male inflorescence may be *discoid* (resembling small flowers), *cupulate* (rounded and swollen), or *gemmiform* (small and bud-like).
Disjunct – a discontinuous distribution of an organism.
Distal – away from the base or point of attachment (opposed to *proximal*).
Distichous – in two opposite rows (e.g., *Fissidens*). (Fig. 39)
Divaricate – widely spreading from each other.
Divergent – spreading from each other.
Divisural Line – the median line of a peristome tooth, usually zig-zag, sometimes furrowed. (Fig. 223)
Dorsal – the *back, lower* or *abaxial* surface of a leaf, the *outer* surface of a peristome tooth, or the *upper* surface of a flattened plant body. (Fig. 40)
Dorsal Lamina – in *Fissidens* the portion of the leaf blade at the back of the costa, opposite the sheathing base. (Fig. 105)
Dorsal Plates – the outer surface of exostome teeth.
Dorsiventral – flattened, with distinct upper and lower surfaces.
Doubly Serrate – with teeth overlapping and joined in pairs. (Fig. 121)

E- – a prefix, meaning not, without.
Echinate – roughened by blunt, spiny projections. (Fig. 162)
Echinulate – minutely spiny.
Echlorophyllose – without chlorophyll.
Ecostate – without a costa. (Fig. 73)
Edentate – without teeth (see also *entire*). (Fig. 114)
Elliptic – essentially oblong but convex at sides and ends. (Fig. 48)
Ellipsoidal – a solid having an elliptic outline. (Fig. 164)
Emarginate – broad at the apex and shallowly notched (deeper than *retuse*).
Emergent – partially exposed, referring to capsules only partly exceeding the tips of the perichaetial leaves. (Fig. 187)
Endemic – limited to a single country or floristic area.
Endostome – the inner peristome (usually consisting of segments, often from a basal membrane, frequently alternating with cilia). (Fig. 224)
Endothecium – the inner cell layer of lining of a capsule, forming a spore-sac; usually applied to the inner embryonic tissue of a young capsule (surrounded by the *amphithecium*).
Enervate – lacking a costa (see also *ecostate*). (Fig. 73)
Ensiform – sword-shaped. (Fig. 60)
Entire – not at all toothed when referring to leaves (Fig. 114); not lobed or divided when referring to peristome teeth.
Eperistomate – without a peristome.
Ephemeral – lasting a few days; short-lived.
Epidermis – a single layer of cells at the surface (particularly applied to stem cross-sections). (Fig. 150)
Epiphragm – in Polytrichaceae, a circular membrane formed by the expanded tip of the columella, partially closing the mouth of the capsule after dehiscence. (Fig. 204)
Equitant – straddling like a rider on horseback, referring to the conduplicate and strongly sheathing leaf bases of *Fissidens*. (Fig. 105)
Erect-Spreading – spreading at an angle of about 45° or less, erecto-patent. (Fig. 26)
Erose – irregularly notched or ragged, as though gnawed. (Fig. 98)
Eutrophic – rich in minerals, hence ± basic or alkaline.
Exannulate – lacking an annulus.
Exasperate – roughened.
Excavate – abruptly hollowed out.
Excurrent – extending beyond the apex or end of lamina. (Fig. 87, 88)
Exospore – the outer wall or surface of a spore.
Exostome – the outer peristome, consisting of *teeth* (only rarely undivided). (Fig. 224)
Exothecium – the outermost layer of the capsule wall, made up of *exothecial* cells. (Fig. 198)
Exserted – projecting and exposed, applied to capsules which project beyond the tips of the perichaetial leaves. (Fig. 188)
Exsiccati – dried specimens; usually referring more specifically to widely distributed, published sets of specimens, with printed labels, used as standards for comparison and often cited in monographic works.

Falcate – curved like the blade of a sickle. (Fig. 71)
Falcate-Secund – strongly curved and turned to one side. (Fig. 25)
Fascicle – a small bundle or cluster. (Fig. 9)
Fasciculate – bunched together, in bundles or *fascicles*.
Fastigiate – with branches nearly parallel and of ± equal length; also erect and columnar, because of the type of branching. (Fig. 13)
Fen – an open boggy habitat receiving nutrients from groundwater (*soligenous*), hence more mineral-rich than a bog (*ombrotrophic* in nutrition, receiving water and nutrients only by precipitation). BOGS are acid; FENS may be acid to neutral or alkaline. RICH FENS are dominated by sedges, with *Sphagnum* a minor element. POOR FENS (often called bogs) are *Sphagnum* dominated and are floristically similar to true bogs but richer in species.
Fenestrate – with broad, window-like openings (a more extreme condition than *perforate*).
Ferruginous – rusty.
Fibril – fine, fiber-like thickening of walls of hyaline cells of *Sphagnum*. (Fig. 151)
Fibrillose – with fine, fiber-like wall thickenings (*fibrils*); applied to hyaline cells of *Sphagnum* in which the fibrils may be spiral or annular. (Fig. 151)
Filiform – slender and elongate, filamentous, thread-like.
Fimbriate – fringed. (Fig. 96)
Flaccid – soft, limp, flabby.
Flagelliform (or Flagellate) – like the lash of a whip. (Fig. 12)
Flagellum (pl. Flagella) – a slender branch; referring to minute, axillary brood-branches and sometimes to long, slender, tapering stems or branches; a long, whip-like structure controlling the movement of the sperm cell. (Fig. 10)
Flexuose – slightly and irregularly bent, twisted, or wavy. (Fig. 113)

Foliose – leafy.

Foot – the basal absorbing organ of the sporophyte. (Fig. 196, 197)

Fovea – a depression or pit. (Fig. 167)

Foveolate – pitted. (Fig. 167)

Frondiferous – producing fronds.

Frondiform – like the fronds of ferns. (Fig. 23, 35)

Frondose – closely and regularly branched in one plane and resembling a fern frond.

Fruit – the capsule (or more loosely the sporophyte).

Fugacious – vanishing or readily falling away.

Fulvous – tawny, dull yellow-brown.

Fundus – the base of a peristome tooth. (Fig. 223)

Furcate – forked. (Fig. 143)

Furfuraceous – scaly.

Fuscous – dull, dark-brown, often tinged with black.

Fusiform – narrow and tapered at both ends, spindle-shaped. (Fig. 138)

Gametangia (sing. Gametangium) – antheridia and archegonia.

Gametophyte – the dominant, sexual generation; in mosses, the green, leafy plant (Fig. 1, 2); in liverworts, the gametophyte may be leafy or thallose.

Gasteropodous – bulging on one side (like a stomach); see also *gibbous* and *ventricose*. (Fig. 217)

Geminate – in pairs.

Gemma (pl. Gemmae) – a small, globose, elliptic, or cylindric body of a few cells serving in vegetative reproduction (see also *brood-body* and *propagulum*). (Fig. 169)

Gemmiferous (or Gemmiparous) – bearing gemmae.

Gemmiform (or Gemmaceous) – bud-like.

Geniculate – abruptly bent, like a knee. (Fig. 190)

Gibbous – swollen on one side above, resembling a hunched back. (Fig. 217)

Glabrous – smooth.

Glaucous – with a whitish, grayish, or bluish overcast (resembling the waxy bloom on a plum).

Globose – spherical. (Fig. 216)

Gonioautoicous (or Gonioautoecious) – monoicous, with the male inflorescence small, gemmiform, and axillary. (Fig. 170)

Gonidia – rarely used to refer to gemmae.

Granulose – roughened with minute, blunt projections (i.e., minutely grainy). (Fig. 163)

Gregarious – growing close together but not in tufts or mats.

Guard Cells – the cells surrounding a stoma, usually paired and kidney-shaped, occasionally a single cell with a central slit. (Fig. 126, 127)

Guide Cells – large, empty, rather thin-walled cells in a median row (as viewed in cross-section) in the costa of many mosses. (Fig. 130)

Gymnostomous – lacking a peristome.

Gynoecium – the female inflorescence (more often applied to hepatics). (Fig. 181)

Gyrate – circinate, coiled. (Fig. 70)

Habit – the aspect or general appearance of a plant.

Habitat – environment.

Hamate – hooked.

Hastate – abruptly broadened and auriculate at base, shaped like an arrow. (Fig. 66)

Helicoid – spirally twisted. (Fig. 111)

Heliophilous – preferring sunny places, photophilous.

Hemi-Isophyllous – in *Sphagnum*, stem leaves morphologically somewhat similar to branch leaves.

Heterogeneous – dissimilar.

Heteroicous (or Heteroecious) – with several forms of inflorescence on the same plant (or various plants of the same species); also called *polyoicous* and *polygamous*. (Fig. 174)

Heteromallous – pointing in all directions (opposed to *homomallous*, all pointing the same way).

Hispid – with short, stiff hairs, bristly. (Fig. 194)

Hoary – whitish or grayish.

Homogeneous – uniform.

Homomallous – pointing the same way.

Humicolous – growing on the ground.

Hyaline – colourless and transparent.

Hyalocyst – in *Sphagnum* leaves, a large, empty, colourless water-storage cell enclosed in a network of green chlorocysts; also called *hyaline cells*. (Fig. 151, 152)

Hyaloderm – in *Sphagnum*, a cortex of large, empty, colourless cells.

Hydric – very wet or aquatic.

Hydrophyte – an aquatic plant, growing submerged or floating.

Hydrophilous – in water, submerged or floating.

Hydroids – tracheid-like conductive cells in the axial strand of many mosses, sometimes also in the costa but not usually in contact with the central strand. (Fig. 150)

Hygrophyte – a plant of wet habitats but not in water.

Hygrophilous – adapted to wet (but not aquatic) habitats.

Hygroscopic (or Hygrometric) – changing position with a change in humidity, readily absorbing moisture (e.g., peristome teeth).

Hypnaceous (or Hypnoid) Peristome – like a *Hypnum*, i.e., a "perfect" double peristome, with 16 lanceolate teeth, cross-striolate at base, papillose above and trabeculate at back and a well-developed endostome consisting of a high basal membrane and 16 lanceolate, keeled segments alternating with one or more cilia. (Fig. 223, 225)

Hypophysis – a conspicuous swelling or expansion of the neck of the capsule (also called an *apophysis*). (Fig. 207, 208)

Imbricate – closely appressed and overlapping. (Fig. 17)

Immarginate – without a border.

Immersed – completely covered; immersed capsules are exceeded by the tips of the perichaetial leaves (Fig. 186); immersed stomata have guard cells ± sunken below the level of the exothecial cells (Fig. 126).

Inaperturate Spores – lacking "apertures" or thin spots in the exine (the most common type of moss spore).

Incised – cut into sharp divisions separated by narrow sinuses. (Fig. 97)

Inclined Capsules – less than vertical, between erect and horizontal. (Fig. 200)

Included – enclosed, not reaching the surface or extending beyond the surrounding organs.

Incrassate – thickened.

Incurved – curved upward and inward, applied to leaf tips and margins. (Fig. 92)

Indehiscent – without an operculum.

Inflated – swollen.

Inflexed (or Infolded) – bent upward and inward, applied to leaf margins (opposed to *reflexed*, bent under and inward). (Fig. 92)

Inflorescence – a cluster of sex organs and the leaves or bracts surrounding them.

Innovation – a new shoot, a branch formed after the maturity of sex organs, usually at the base of an inflorescence. (Fig. 8)

Inoperculate (or Deoperculate) – without the operculum, referring to a capsule after the operculum has fallen. (Fig. 224)

Insertion – the place of attachment of a leaf, branch, or peristome.

Intricate – interwoven, tangled.

Involute – inrolled, applied to leaf margins (opposed to *revolute*). (Fig. 93)

Isodiametric – about as broad as long (including square, rounded, or hexagonal). (Fig. 135)

Isophyllous – in *Sphagnum*, stem and branch leaves morphologically similar.

Jugum (pl. Juga) – a pair of leaves, rarely applied to leaves of *Fissidens*.

Julaceous – smoothly cylindric, like a worm or a catkin, referring to stems or branches with crowded and imbricate leaves. (Fig. 19)

Keeled - sharply folded along the middle, like the keel of a boat, *carinate*. (Fig. 104)

Lacerate - deeply and irregularly slashed or torn. (Fig. 99)
Laciniate - dissected into fine, deep, irregular divisions (*laciniae*), ciliate-fringed.
Lacunose - with irregular lumina because of deeply porose cell walls, or perforated, sometimes referring to cells with very thick walls (the lumina resembling a blank space or cavity).
Lamellae (sing. Lamella) - green ridges or plates on the costa or lamina of some moss leaves (Fig. 94, 95); thickened plates on peristome teeth, derived from cell walls.
Lamellose - composed of or furnished with lamellae.
Lamina (pl. Laminae) - the leaf blade (as distinguished from the *costa*). (Fig. 42)
Lanceolate - lance-shaped, narrow and tapered from the base (narrower than *ovate*). (Fig. 59)
Lanuginose - woolly, tomentose.
Lateral - at the side; opposed to *terminal*.
Lax - soft or loose, usually referring to large thin-walled cells.
Lenticular (or Lentiform) - doubly convex, lens-shaped. (Fig. 154)
Leptodermous - thin-walled, referring to leaf cells and also to capsules with soft or delicate walls (opposed to *pachydermous*).
Leucocyst - the large, empty, hyaline leaf cells of *Sphagnum*, Leucobryaceae, and *Paraleucobryum* (also called *hyalocysts*). (Fig. 151, 152)
Lid - operculum. (Fig. 200)
Ligulate - strap-shaped (longer and narrower than *lingulate*). (Fig. 55)
Limb - the upper part of a leaf, contrasted with the base. (Fig. 94)
Limbate - bordered. (Fig. 42)
Linear - very narrow and elongate, with nearly parallel sides (narrower than *ligulate*). (Fig. 56)
Lingulate - tongue-shaped, oblong with a broadened apex. (Fig. 58)
Lumen (pl. Lumens or Lumina) - the cell cavity. (Fig. 141)
Lunate (or Lunulate) - crescent-shaped. (Fig. 147)
Lurid - dingy brown or yellow, pale.

Macronemata (sing. Macronema) - large, freely branched rhizoids produced around branch primordia and in the leaf axils (Mniaceae). (Fig. 37)
Mammilla (pl. Mammillae) - a bulging protuberance with a blunt, nipple-like tip. (Fig. 148, 149)
Mammillose (or Mammillate) - convex with a blunt central projection. (Note: also correctly spelled mamilla, mamillose, etc.). (Fig. 148, 149)
Mat - a densely interwoven, horizontal form of growth (*cf. Hypnum*).
Median - middle.
Median Leaf Cells - cells in the upper middle of the leaf; in leaves with a well-developed costa, those between costa and margin about $^2/_3$ up the leaf.
Membrane Gaps - irregular openings in the outer walls of hyaline cells of *Sphagnum* stem leaves. (Fig. 153)
Meristem - the growing point or a zone of continuing growth.
Mesic - moist, neither very wet nor very dry but intermediate.
Mesophytic - adapted to a temperate climate or a relatively moist habitat.
Mesotrophic - more or less neutral in reaction, neither acid nor basic (cf. *eutrophic* and *oligotrophic*).
Micrometer - one-thousandth of a millimeter (represented by μm); replaces *micron* (μ).
Micronemata (sing. Micronema) - small, sparsely branched rhizoids scattered along the stems without any definite location in relation to the leaves or branch primordia (Mniaceae). (Fig. 37)
Midrib - a mid-vein or single costa. (Fig. 42)
Mitrate (or Mitriform) - conic and undivided or equally lobed at base, similar to a bishop's miter, referring to calyptrae (opposed to *cucullate* or split on one side). (Fig. 193)
Moniliform - resembling a string of beads.
Monoicous (or Monoecious) - with antheridia and archegonia on the same plant, including autoicous, synoicous, paroicous, and polyoicous (opposed to *dioicous*). (Fig. 170-175)
Monolete Spores - having a single scar on the surface of the exine (as in *Funaria hygrometrica* and *Bryum caespiticium*).
Monopodial Branching - differentiation into primary and secondary shoots (or stems and branches).
Morphology - form, structure.
Mucro - a short, abrupt point. (Fig. 76)
Mucronate - ending abruptly in a short point usually caused by a shortly excurrent costa (Fig. 76); APICULATE indicates a somewhat longer tip (Fig. 81) and CUSPIDATE a longer, stouter, tooth-like tip (Fig. 82).
Multi- - prefix meaning many, as in *multicellular, multistratose*.
Muriculate - roughened with minute, sharp points (diminutive of *muricate*).
Muticous - without a point or awn.

n - number of chromosomes in the gametophyte or haploid generation; when a number like 19 + 2 is given, + 2 indicates the presence of m-chromosomes which are minute, accessory chromosomes.
2n - number of chromosomes in the sporophyte or diploid generation.
Naked - lacking various organs or appendages; a *naked calyptra* lacks hairs.
Nanandry - sexual dimorphism, with male plants dwarfed (see also *phyllodioicous* and *pseudomonoicous*).
Navicular - boat-shaped. (Fig. 44)
Neck - the sterile basal portion of a capsule, sometimes considerably differentiated. (Fig. 195)
Nerve - costa. (Fig. 42)
Nidulant - nesting, rarely used to refer to the bud-like plants of *Ephemerum* nested on an abundant protonematal mat.
Nitrophilous - preferring substrata rich in nitrogenous compounds.
Node - the joint, often swollen, where segments of the peristome are united. (Fig. 231)
Nodose - with knob-like thickenings. (Fig. 231)
Nodulose - minutely knobbed.
Nutant - nodding, drooping.

Ob- - a prefix indicating inversion, as in *obovate* (Fig. 52) (egg-shaped, with the broader portion at the apex rather than the base), *obconic, obclavate, obcordate*, etc.
Oblate - wider than long.
Oblong - much longer than broad, with nearly parallel sides. (Fig. 50)
Obscure - dark, indistinct.
Obsolete - scarcely evident, almost lacking (usually referring to the costa).
Obtuse - broadly pointed (more than 90°); used by some authors to mean blunt or rounded. (Fig. 77)
Ochraceous - brownish-yellow.
Oligo- - a prefix denoting few.
Oligoporous - with a few pores.
Oligotrophic - poor in minerals, hence acid in reaction (opposed to *eutrophic*).
Olivaceous - olive-green.
Opaque - dark, not transparent or translucent.
Operculate - capsule with an operculum.
Operculum (pl. Opercula) - the lid covering the mouth of a moss capsule, falling at maturity to release the spores. (Fig. 200)
Oral - referring to the mouth of a capsule.
Orbicular - nearly circular. (Fig. 53)
Orifice - mouth of a capsule.
Oval - broadly elliptic. (Fig. 49)

Ovate – egg-shaped (with the base broader than the apex). (Fig. 51)

Ovoid – an egg-shaped solid. (Fig. 159)

Oxylophile (or Oxylophyte) – a plant of acid habitats, an acidophile.

Pachydermous – thick-walled, referring to cell walls or to firm and tough or leathery capsules.

Palmate – with finger-like lobes radiating from the centre.

Panduriform – shaped like the body of a violin (obovate with a sinus on either side). (Fig. 46)

Papilla (pl. Papillae) – a minute protuberance of various forms. (Fig. 143, 144)

Papillose – roughened by one to many minute protuberances.

Paraphyllium (pl. Paraphyllia) – small, green, filiform, lanceolate, or leaf-like, sometimes branched structures often produced on stems or branches of pleurocarpous mosses. (Fig. 125)

Paraphyses (sing. Paraphysis) – hyaline or yellowish, uniseriate, multicellular hairs, sometimes club-shaped, mingled with the antheridia (and often with archegonia). (Fig. 178, 180, 181)

Parenchyma – a tissue of relatively undifferentiated cells, usually thin-walled and isodiametric (hence with broad ends). (Fig. 150)

Parenchymatous – composed of ± short cells joined end to end (opposed to *prosenchymatous*).

Paroicous (or Paroecious) – with antheridia and archegonia in the same inflorescence but not mixed, the antheridia in the axils of uppermost and perichaetial leaves. (Fig. 175)

Patent – spreading at 45° or more (used by some authors to mean spreading at 26–45°, *patulous* meaning 46–90°). (Fig. 27)

Pectinate – resembling a comb.

Pedicel – the stalk or seta on which the capsule is borne. (Fig. 196)

Pellucid – clear, translucent or transparent.

Peltate – shield-like, flat and attached by a stalk on the underside.

Pendent – hanging. (Fig. 219)

Pendulous – somewhat drooping, inclined more than horizontally; with stems and branches hanging, a growth form common in tropical cloud forests.

Penicillate – like an artist's brush, ending in a tuft. (Fig. 7)

Percurrent – extending to the apex. (Fig. 86)

Perfect Peristome – see *bryaceous* or *hypnaceous peristome*. (Fig. 223)

Perichaetium (pl. Perichaetia) – the leaves (*perichaetial leaves*) or bracts surrounding the archegonia, opposed to the *perigonium*.

Perigonium (pl. Perigonia) – the leaves (*perigonial leaves*) or bracts surrounding the antheridia, opposed to the *perichaetium*.

Perigonial Bud – the male inflorescence. (Fig. 178)

Perichaetial Bud – the female inflorescence. (Fig. 181)

Peristome – a single or double circle of teeth inside the mouth of the capsule; the outer peristome (or *exostome*) consisting of *teeth*, the inner peristome (or *endostome*) consisting of *segments*, sometimes alternating with *cilia*, often rising from a *basal membrane*. (Fig. 195, 224).

Phaneropore – with superficial stomata, that is, the guard cells at the same level as other exothecial cells and not sunken in chambers (opposed to *cryptopore*). (Fig. 127)

Photophilous – preferring well-lighted habitats, *heliophilous*; opposed to *sciaphilous*.

Phyllodioicous – nanandrous; with dwarf male plants which rest on leaves or tomentum of the larger female plants.

Phyllotaxy – the arrangement of leaves in regard to the axis.

Piliferous – hair-pointed. (Fig. 72)

Pilose – long-hairy.

Pinnate – with numerous, spreading branches on two sides of the axis and thus resembling a feather. (Fig. 4)

Pit – small opening or pore through the walls of adjoining cells, sometimes marked by a conspicuous depression in thick-walled cells. (Fig. 141)

Plane – flat. (Fig. 89)

Pleurocarpous – producing the sporophytes laterally (from a mere perichaetial bud or a short, specialized branch) rather than at the stem tip; PLEUROCARPOUS MOSSES are usually prostrate, freely branched and grow in mats rather than tufts. (Fig. 2)

Plicate – folded in longitudinal pleats (*plicae*). (Fig. 68)

Plumose – closely and regularly pinnate, feathery. (Fig. 32)

Pluri- – a prefix denoting many, as in *pluripapillose, pluriseriate,* or *pluristratose*.

Polyedaphic – occurring on many kinds of substrates.

Polygamous – with antheridia and archegonia in separate inflorescences and also mixed together on the same plants, or on different plants of the same species (also called *polyoicous* and *heteroicous*). (Fig. 174)

Polymorphous (or Polymorphic) – of many forms, variable.

Polyoicous (or Polyoecious) – see polygamous. (Fig. 174)

Pores – small openings or "pits" in the walls of some cells, sometimes conspicuous as depressions in thick walls between adjacent cells (Fig. 141); in *Sphagnum* the pores are particularly large and conspicuous in the exposed walls of the hyaline cells of branch leaves and also in outer stem cells (Fig. 151, 153); porose cell walls may be minutely or quite obviously perforated.

Porose – pierced with small holes; also called PITTED. (Fig. 141, 151)

Predominant – very conspicuous, prominent.

Primary Stem – the main stem, often creeping or rhizome-like with reduced or scale-like leaves.

Processes – segments of the endostome.

Procumbent – spreading, prostrate.

Proliferous – continuing growth by the production of a new stem (or *innovation*).

Propagulum (pl. Propagula) – reduced bud, branch, or leaf serving in vegetative reproduction (see also *brood body* and *gemma*). (Fig. 168)

Prorate – cells that appear papillose by protruding ends (i.e., "papillose by projecting cell ends" according to many bryologists). (Fig. 139)

Prorula – a protrusion of the distal or proximal ends of (superficial) cell walls.

Prosenchyma – a tissue made up of elongate cells with tapered ends. (Fig. 142)

Prosenchymatous – with narrow, elongate cells overlapping at the ends (opposed to *parenchymatous*).

Prostrate – creeping.

Protean – exceedingly variable.

Protonema (pl. Protonemata) – green, branched filaments produced on germination of spores and giving rise to a leafy or thallose gametophyte (Fig. 128); in *Sphagnum and Andreaea* the protonema is ± thallose rather than filamentous (Fig. 129); *secondary protonemata* are sometimes also produced on leaves or stems of mosses, sometimes at wounds (e.g., broken leaves).

Protonematous Rhizoids – macronemata capable of producing protonemata if detached from stems (Mniaceae).

Proximal – the part nearest the axis (opposed to DISTAL).

Pseudo- – a prefix denoting false.

Pseudannulus – an apparent annulus consisting of small, non-vesiculose cells.

Pseudautoicous or Pseudomonoicous – with dwarf males growing on female plants.

Pseudoparaphyllium (pl. Pseudoparaphyllia) – a small, unistratose, foliose (Fig. 124) or filamentous (Fig. 123) structure resembling paraphyllia but occurring only around the branch primordia or branch bases of pleurocarpous mosses.

Pseudopodium – an elongation of the gametophytic axis below the sporophyte in *Sphagnum* and *Andreaea*, serving the function of a seta (Fig. 197); also applied to a similar extension of a stem tip bearing clusters of gemmae (e.g., *Aulacomnium*). (Fig. 189)

Pseudopore – Pore-like features developed along the commissures in branch leaves of *Sphagnum*. Formed by extensions of the reinforcing fibrils that extend parallel to the commissures and perpendicularly between the fibril bands.
Pseudostomata – in *Sphagnum* capsules, vestigial stomata, consisting of two guard cells but no pore. (Fig. 160)
Pulvinate – cushion-like.
Punctate – dotted, usually referring to spore markings.
Punctulate – minutely dotted.
Pungent – ending in a stiff or hard point.
Pyriform – pear-shaped. (Fig. 218)

Quadrate – square.
Quinquefarious – in five rows.

Radicles – rhizoids, slender, non-chlorophyllose threads attaching the plants to the substrate, often covering stems, occasionally growing from leaf tips; the radicles of mosses usually have oblique cross-walls. (Fig. 1)
Radiculose – covered with rhizoids.
Ramentum – a woolly covering or tomentum, made up of radicles.
Ramuli (sing. Ramulus) – the smaller divisions of a much branched plant.
Ramulose – with small branches.
Rank – row.
Receptacle – an expanded and ± elevated structure bearing sex organs and eventually sporophytes, rarely used in the Musci to refer to the tissue on which the reproductive organs are borne.
Recurved – curved downward or backward, referring to leaf margins or tips, marginal teeth, or peristome teeth. (Fig. 90)
Reflexed – bent backward. (Fig. 90)
Regular – symmetric.
Reniform – kidney-shaped. (Fig. 64)
Repand – slightly sinuose.
Repent – creeping.
Resorption – disappearance or erosion of parts of cell walls in *Sphagnum* leaves. (Fig. 152, 153)
Resorption Furrow – a furrow produced by the disappearance of the outer cell walls at the leaf margins of some species of *Sphagnum*, best seen in cross-section. (Fig. 152, 153)
Reticulate – in a network.
Retort Cells – cells with a pore at the upper end, terminating a short, projecting neck, found in the cortex of branches in many species of *Sphagnum*. (Fig. 161)
Retuse – slightly indented at a broad apex. (Fig. 79)
Revoluble – rolling away, referring to an annulus which falls in a ring. (Fig. 221)
Revolute – rolled downward and backward, referring to leaf margins. (Fig. 91)
Rhizautoicous – monoicous, with the male inflorescence on a very short branch attached to the female stem by rhizoids and thus appearing to be a separate plant.
Rhizoidal Gemma (or Tuber) – asexual reproductive body borne on a rhizoid (normally subterranean). (Fig. 131)
Rhizoids – simple or branched, septate filaments, usually with oblique cross-walls, dead at maturity, anchoring the plant and sometimes covering the stem (see also *radicles*). (Fig. 1)
Rib – a longitudinal ridge on capsules or other organs. (Fig. 203)
Rhizome – a slender, horizontal, subterranean, root-like stem. (Fig. 28)
Rhombic – diamond-shaped. (Fig. 136)
Rhomboidal – longer than rhombic, oblong-hexagonal. (Fig. 137)
Ringed Pore – in *Sphagnum*, a pore with a fibril ring around it.
Rosette – circular (rose-like) arrangement of leaves. (Fig. 34)
Rostellate – shortly or minutely beaked.
Rostrate – beaked. (Fig. 202)
Rostrum – see *beak*. (Fig. 205)
Rosulate – in rosettes. (Fig. 34)
Rotund – round.
Rufous – reddish.
Rugose – with irregular transverse wrinkles or undulations. (Fig. 69)
Rugulose – slightly rugose.
Rupestral – growing on rocks (also called *saxicolous*).

Saccate – abruptly and deeply concave, forming a sack.
Saprophyte – living on dead organic matter, opposed to *parasite*.
Saxicolous – growing on rocks (*rupestral*).
Scabrous – rough.
Scalariform – ladder-like.
Scalpelliform – asymmetric and resembling the blade of a penknife. (Fig. 61)
Scarious – dry and thin, scale-like or membranous.
Sciaphilous – preferring shady habitats.
Scindula – a protrusion of the distal or proximal ends of (superficial) cell walls (see *prorula*).
Scleroderm – the thick-walled cells forming a woody cylinder in stems and branches of *Sphagnum*.
Secondary Stem – branches arising from the main or primary stem.
Secund – turned to one side.
Segments – the tooth-like divisions of the inner peristome, sometimes called *processes*. (Fig. 223)
Septate – divided by cell walls, having partitions.
Seriate – in rows.
Serrate – saw-toothed, with marginal teeth pointing forward (*doubly serrate* is when the teeth overlap and are joined in pairs). (Fig. 120, 121)
Serrulate – minutely serrate. (Fig. 119)
Sessile – without a stalk or seta, hence *immersed*.
Seta (pl. Setae) – the stalk supporting the capsule. (Fig. 196)
Setaceous – bristle-like. (Fig. 83)
Sheath – basal portion of leaf clasping stem, e.g., leaf of *Polytrichum*. (Fig. 94)
Sheathing – ± surrounding and clasping the stem or the base of the seta. (Fig. 36)
Shoulder – the area where a leaf base is abruptly narrowed to the limb. (Fig. 94)
Sigmoid – somewhat S-shaped. (Fig. 133)
Siliceous – having a high silicon content, sandy (usually poor in bases).
Silicicolous – growing on sandstone or other siliceous rock.
Simple – applied to structures, organs or plants that are unbranched.
Sinistrorse – twisted to the left.
Sinuose (or Sinuate) – wavy. (Fig. 134)
Sinuolate – minutely or slightly wavy.
Sinus – a depression between two lobes or prominences; the indentation between lobes of a leaf. (Fig. 65)
Sordid – of a dirty or muddy colour.
Spatulate – tapered from a broad, rounded apex (similar to lingulate but more abruptly narrowed from a broad apex). (Fig. 57)
Spiculose – sharply and minutely toothed or papillose. (Fig. 117)
Spindle-shaped – fusiform; narrow, elongate and tapered at both ends. (Fig. 138)
Spinose – spiny, with sharp, slender teeth or projections. (Fig. 41, 118)
Spinulose – minutely spiny.
Sporangium (pl. Sporangia) – the spore case or capsule of the sporophyte. (Fig. 196, 197)
Spore Sac – a cavity in the capsule or sporangium of a moss where the spores are produced.
Spores – minute, mostly spherical, nearly always unicellular bodies, produced in the capsule as a result of reduction division, giving rise on germination to protonemata.
Sporophyte – the spore-bearing generation; the spore-bearing plant, produced by the fertilization of an egg, remaining attached to the gametophyte and partially dependent on it, typically consisting of foot, seta and capsule. (Fig. 1, 2, 196, 197)

Spreading – at an angle of 45° or more; *wide-spreading* means nearly 90°, *squarrose* 90°, *squarrose-recurved* 90° with recurved tips. (Fig. 27)
Squalid – sordid or dirty.
Squamose – scaly or scale-like.
Squarrose – spreading at right angles. (Fig. 30)
Squarrose-recurved – spreading at right angles, with the tips curved downward. (Fig. 31)
Stegocarpous – with operculum differentiated (opposed to *cleistocarpous* or *astomous*).
Stellate – star-shaped.
Stereids – slender, elongate, thick-walled, fiber-like cells found in groups in the costa of some mosses; also applied to linear, thick-walled border cells. (Fig. 130)
Sterile – barren, not fertile, lacking sporophytes.
Stipe – the unbranched base of a dendroid or frondose plant.
Stipitate – with a trunk-like base.
Stoloniferous (or Stoloniform) – plants that bear slender, creeping, usually minutely leaved stems and branches (*stolons*), often radiculose near the tips (e.g., sterile shoots of *Plagiomnium*).
Stoma (pl. Stomata) – opening in the capsule wall, usually in the neck, surrounded by guard cells. (Fig. 126, 127)
Stramineous – straw-coloured.
Strangulate – deeply constricted below the mouth of a capsule. (Fig. 209)
Stratose – in distinct layers.
Stratum (pl. Strata) – a layer.
Striate – marked with fine, longitudinal ridges (*striae*). (Fig. 201)
Strict – straight and rigid.
Striolate – finely ridged.
Strumose – with a goiter-like swelling (or *struma*) at the base; applied to some capsules. (Fig. 205)
Strumulose – with a small or indistinct swelling at one side of the capsule base.
Sub- – a prefix meaning nearly, almost, somewhat, as in *subacute, subentire, subpercurrent, subdendroid*, or *subquadrate*; also used to mean under, as *submedian* or *subterranean*.
Subula – a long, slender point. (Fig. 85)
Subulate – slenderly long-acuminate, shaped like a needle or awl. (Fig. 84)
Sulcate – grooved or furrowed. (Fig. 202)
Surculus – a sucker-like outgrowth, rarely used to refer to upright secondary stems arising from a horizontal primary stem or "rhizome".
Suture – a line formed by the junction of two parts.
Synoicous (or Synoecious) – with antheridia and archegonia mingled in the same inflorescence. (Fig. 172, 173)
Systylius (or Systylous) – with the operculum remaining attached to the tip of the columella after dehiscence. (Fig. 212)

Taxon (pl. Taxa) – a taxonomic group or entity of any rank (e.g., species, variety, form, etc.).
Teeth – see *tooth*.
Terete – rounded in cross-section, cylindric. (Fig. 19)
Terrestrial – growing on the ground, *terricolous*.
Tessellated – checkered, in a pattern of squares; applied to the basal membrane of *Tortula*. (Fig. 222)
Tetrad – a group of four developing or rarely mature spores; because of development in tetrads some mature spores are ellipsoidal, angular, or ± kidney-shaped, sometimes *tetrahedral*.
Tetrahedral – having or made up of four sides; e.g., *Sphagnum* spores.
Thallose – flat, not much differentiated, and cordate or ribbon-like in body form. (Fig. 129)
Tomentose – woolly, densely radiculose, covered by a *tomentum* of rhizoids. (Fig. 38)
Tomentum – a covering of hair; the dense felt of rhizoids covering the lower parts of the stems in many mosses.
Tooth – a division of the outer peristome (divisions of the endostome are called *segments* or *processes* (Fig. 223); also applied to an irregularity or projection on leaves (*toothed*). (Fig. 118)
Tortuose – irregularly bent or twisted. (Fig. 110)
Trabeculate – with projecting cross-bars (*Trabeculae*) on the peristome teeth. (Fig. 227)
Tri- – a prefix meaning thrice.
Trifarious (or Tristichous) – in three rows. (Fig. 22)
Trigonous (or triquetrous) – three-cornered.
Trilete Spores – having a three-pronged scar on the wall (as in *Sphagnum*). (Fig. 158)
Triradiate – three-pronged; often used to refer to the scar of a trilete spore.
Truncate – abruptly cut off or squared off at the apex.
Tuber – see rhizoidal gemma. (Fig. 131)
Tuberculate – beset with knobby projections. (Fig. 166)
Tubulose – tube-like, usually referring to leaves with strongly incurved margins. (Fig. 106)
Tufa – a porose limestone formed by deposition from calcareous waters (often formed because of the CO_2 relationships – in photosynthesis and respiration – of mosses).
Tuft – clump or cluster of ± erect shoots.
Tumid – swollen, inflated.
Turbinate – top-shaped. (Fig. 211)
Turgid – plump or swollen.

Umbonate – convex with an abrupt, rounded, central point. (Fig. 80)
Uncinate – hooked. (Fig. 70)
Undulate – wavy. (Fig. 67)
Unequal – asymmetric.
Unguiculate – ending in a point similar to an animal's claw. (Fig. 85)
Uni- – a prefix meaning one, as in *unilateral, unipapillose, unistratose*, or *uniseriate*.
Urceolate – urn-shaped, applied to capsules constricted below a wide mouth and abruptly narrowed at the base. (Fig. 210)
Urn (or Theca) – the spore-bearing portion of a capsule, as opposed to the sterile neck. (Fig. 195)
Utricle – a vesicle, rarely used to refer to the enlarged cortical cells of *Sphagnum*.

Vaginate – sheathing.
Vaginant Lamina – in *Fissidens*, the expanded lamina at base of the leaf which clasps the stem and the base of the leaf above it. (Fig. 105)
Vaginula – the ring or sheath enveloping the base of the seta, derived from the base of the archegonium and remaining after the separation of the calyptra.
Valve – one of the segments into which a capsule separates on dehiscence; among Bryophyta, applied only to some liverworts and the Andreaeopsida. (Fig. 206)
Vegetative Leaves – all the leaves on the plant except the perigonial and perichaetial leaves.
Venter – the swollen basal portion of an archegonium, containing the egg. (Fig. 182)
Ventral – the inner surface of a peristome tooth, the upper (*adaxial*) surface of a moss leaf, or the lower surface of a prostrate stem or thallus. (Fig. 40)
Ventral Lamina – in *Fissidens*, the portion of the leaf blade above the vaginant lamina. (Fig. 105)
Ventricose – bulging on one side below (like a stomach). (Fig. 217)
Vermicular – narrowly cylindric and curved, like a worm. (Fig. 132)
Verrucose (or Verruculose) – very warty, much covered with warts. (Fig. 145, 146)
Vesiculose – inflated, bladder-like.
Villi (sing. Villus) – paraphyllia. (Fig. 125)
Vittate – striped.

Wefts - a loosely interwoven, often ascending growth form (as in *Thuidium*).
Whorled - arranged in a ring or circle. (Fig. 15)
Wide-Spreading - spreading at a wide angle but less than 90° (which is squarrose). (Fig. 29)

Xeric - very dry.
Xeromorphic - structurally adapted for dryness.
Xerophilous - preferring dry places.
Xerophyte - a plant of dry, often hot places.

Zygomorphic - bilaterally symmetric. (Fig. 210, 215, 216)

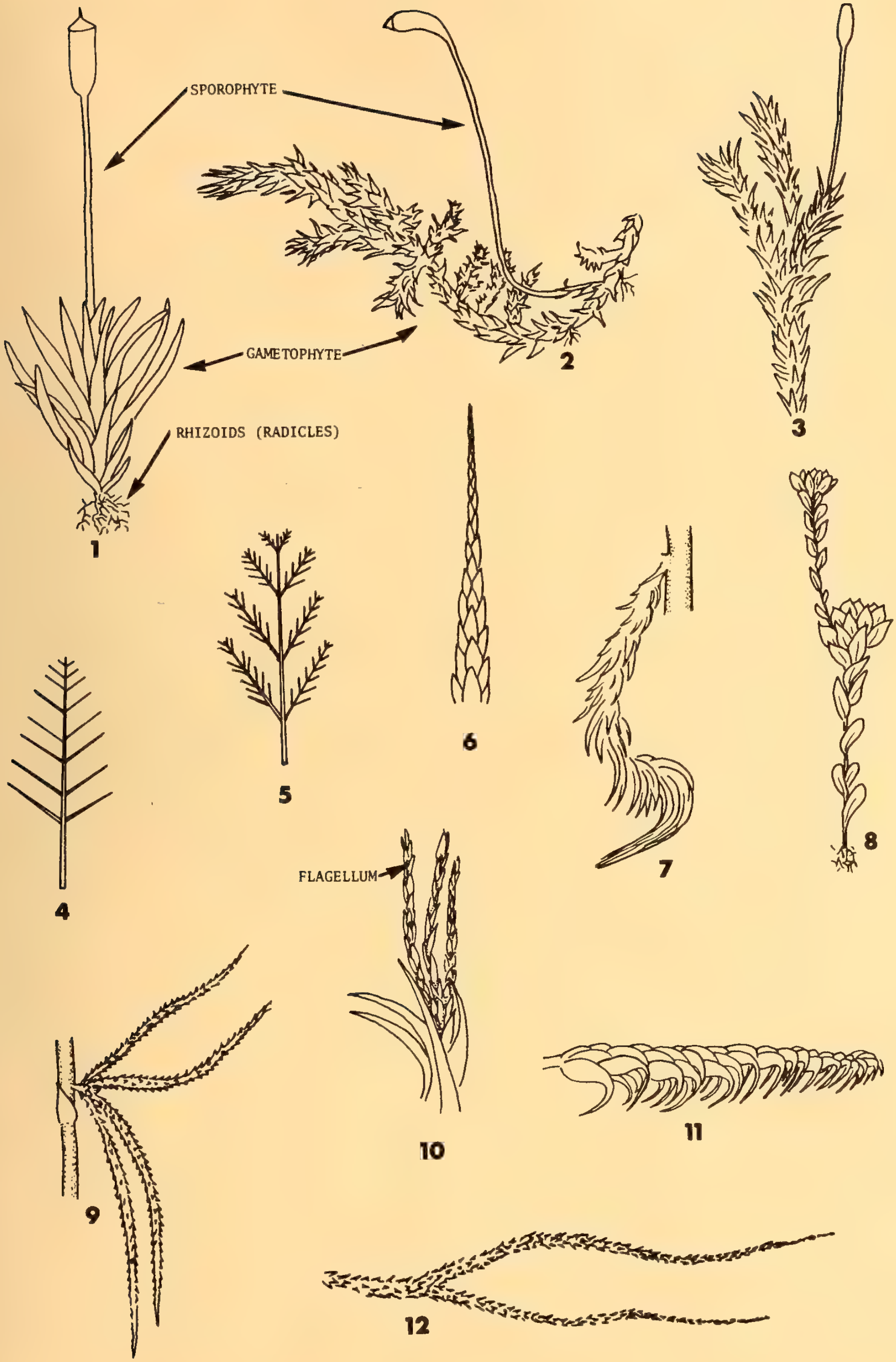
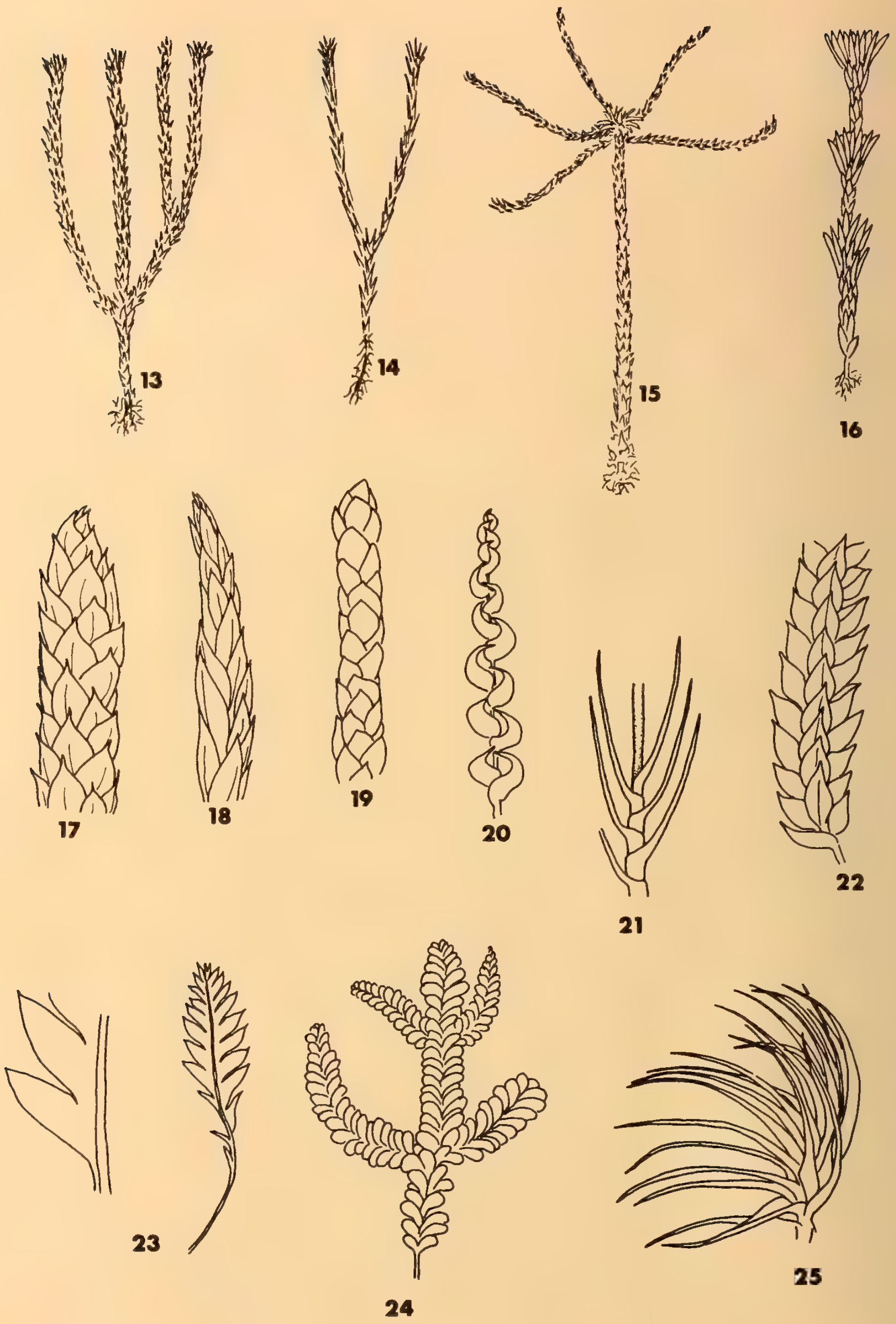

SPOROPHYTE
GAMETOPHYTE
RHIZOIDS (RADICLES)
1
2
3
4
5
6
7
8
FLAGELLUM
9
10
11
12

Plate 399. **1.** Acrocarpous. **2.** Pleurocarpous. **3.** Cladocarpous. **4.** Pinnate. **5.** Bipinnate. **6.** Attenuate. **7.** Penicillate. **8.** Innovation. **9.** Fascicle. **10.** Flagella. **11.** Decurved. **12.** Flagelliform.


13
14
15
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24
25

Plate 400. **13.** Fastigiate. **14.** Dichotomous. **15.** Whorled. **16.** Annotinous. **17.** Imbricate. **18.** Appressed. **19.** Julaceous, terete. **20.** Catenulate. **21.** Amplexicaul. **22.** Trifarious. **23.** Confluent, frondiform. **24.** Complanate. **25.** Falcate-secund.

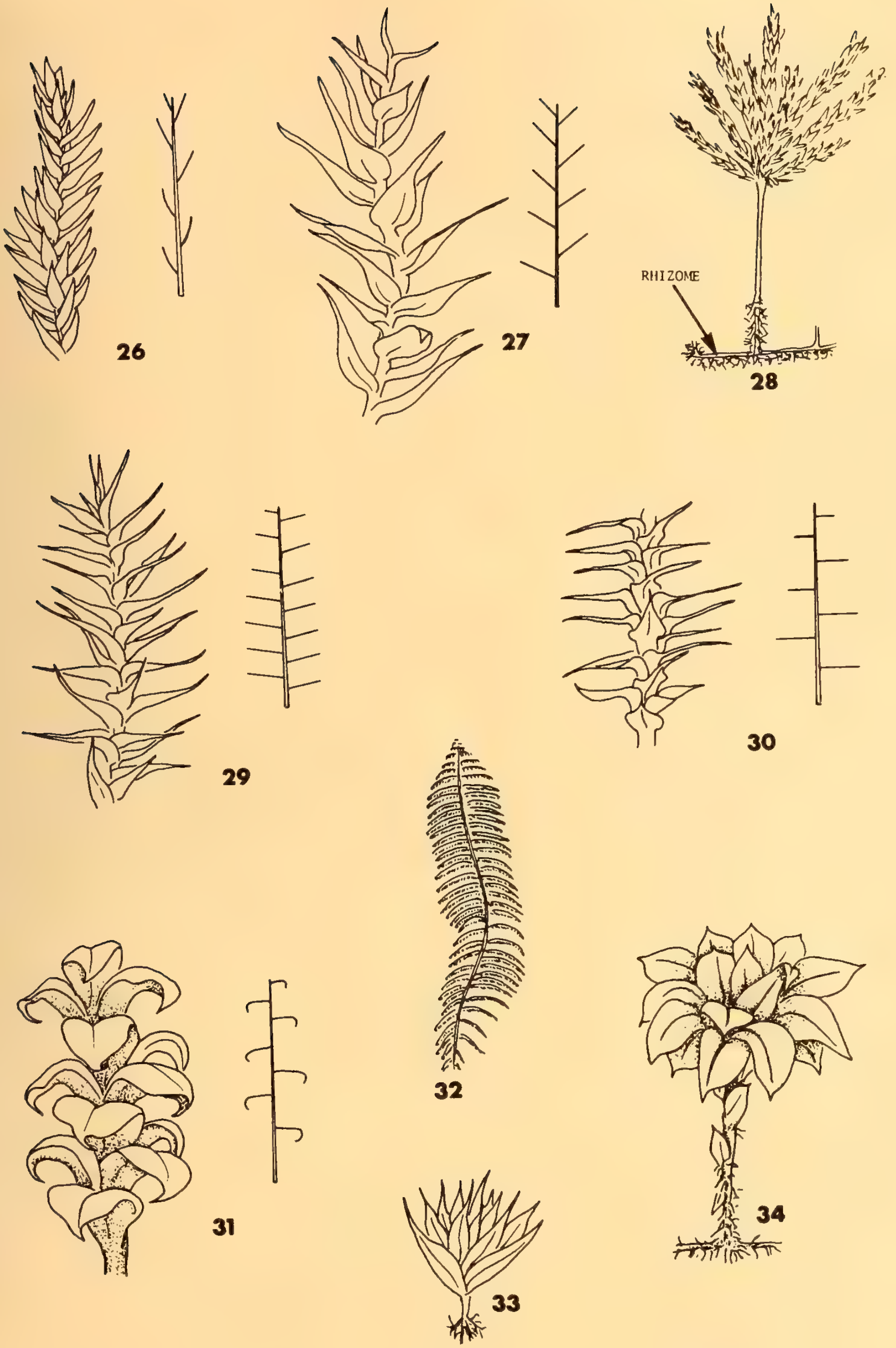

26
27
RHIZOME
28
29
30
32
31
34
33

Plate 401. **26.** Erect-spreading. **27.** Spreading, patent. **28.** Dendroid. **29.** Wide-spreading, patulous. **30.** Squarrose. **31.** Squarrose-recurved. **32.** Plumose. **33.** Bulbiform. **34.** Rosette, rosulate.

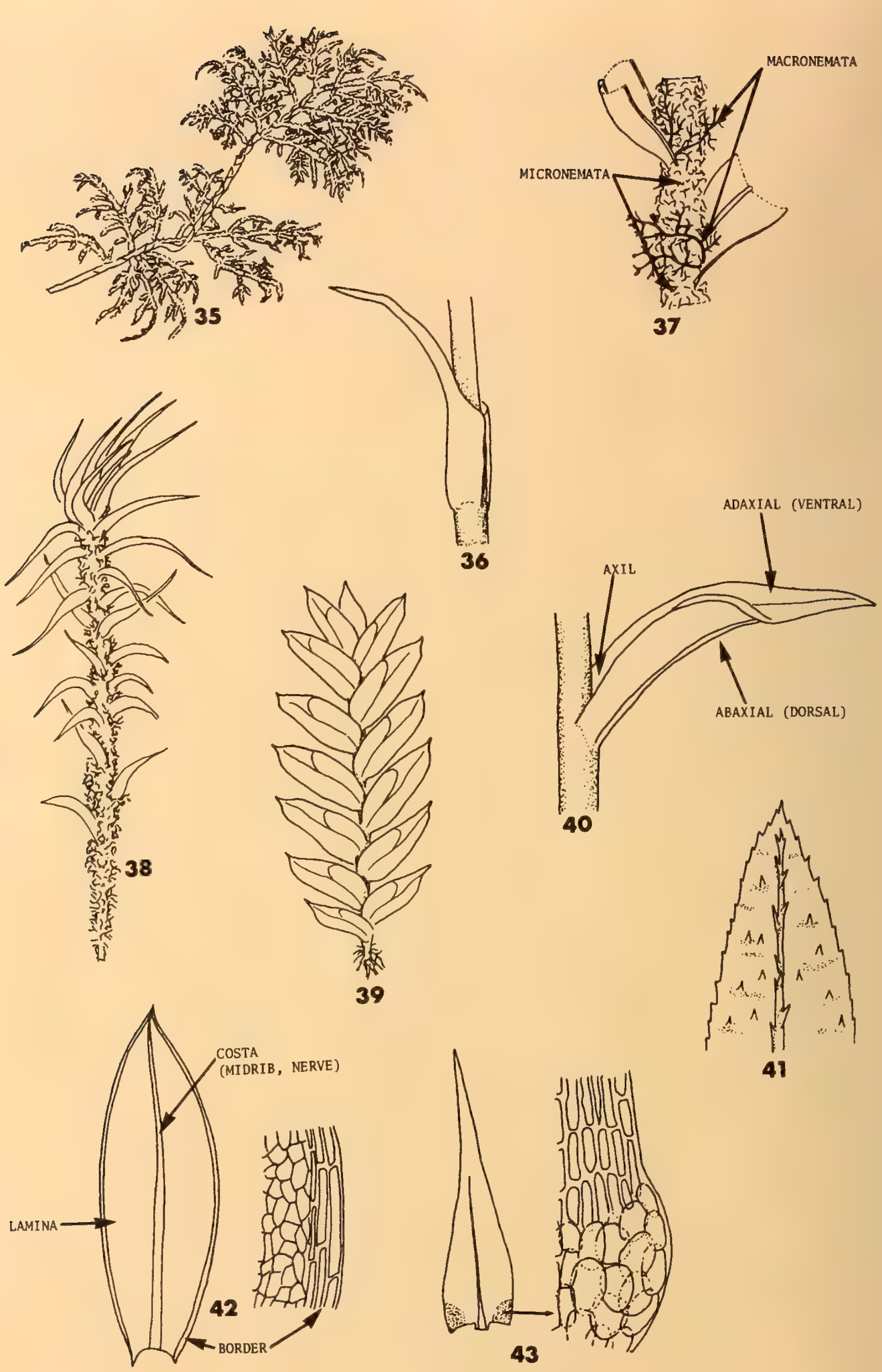
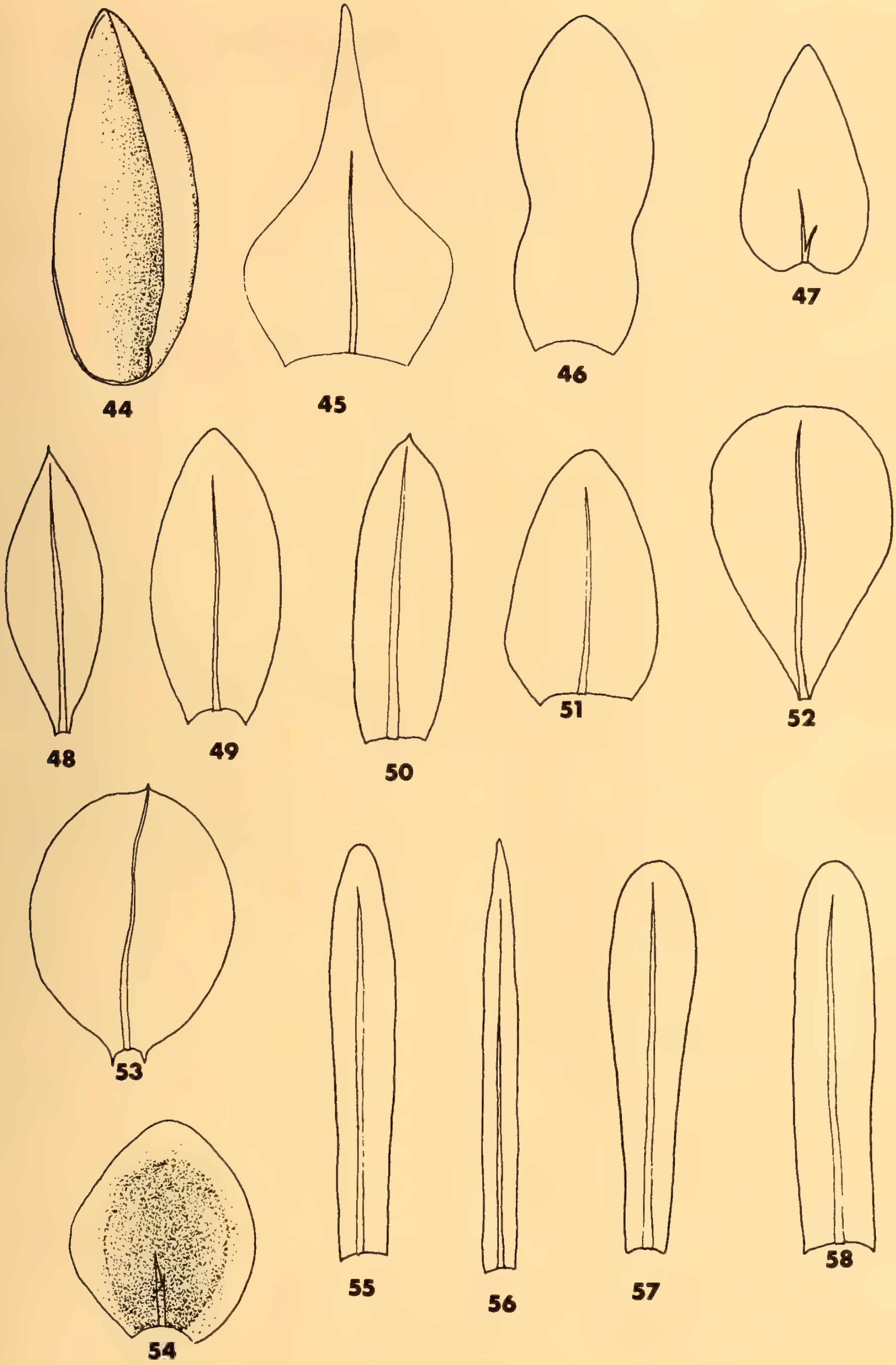

MACRONEMATA
MICRONEMATA
35
37
36
38
ADAXIAL (VENTRAL)
AXIL
ABAXIAL (DORSAL)
39
40
41
COSTA
(MIDRIB, NERVE)
LAMINA
42
BORDER
43

Plate 402. **35.** Frondiform. **36.** Sheathing. **37.** Macronemata and micronemata. **38.** Tomentose. **39.** Distichous. **40.** Leaf axil, adaxial (ventral) and abaxial (dorsal) surfaces. **41.** Spinose. **42.** Limbate, bordered. **43.** Alar cells.


44
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58

Plate 403. **44.** Cymbiform, navicular. **45.** Deltoid. **46.** Panduriform. **47.** Cordate. **48.** Elliptic. **49.** Oval. **50.** Oblong. **51.** Ovate. **52.** Obovate. **53.** Orbicular. **54.** Cochleariform. **55.** Ligulate. **56.** Linear. **57.** Spatulate. **58.** Lingulate.

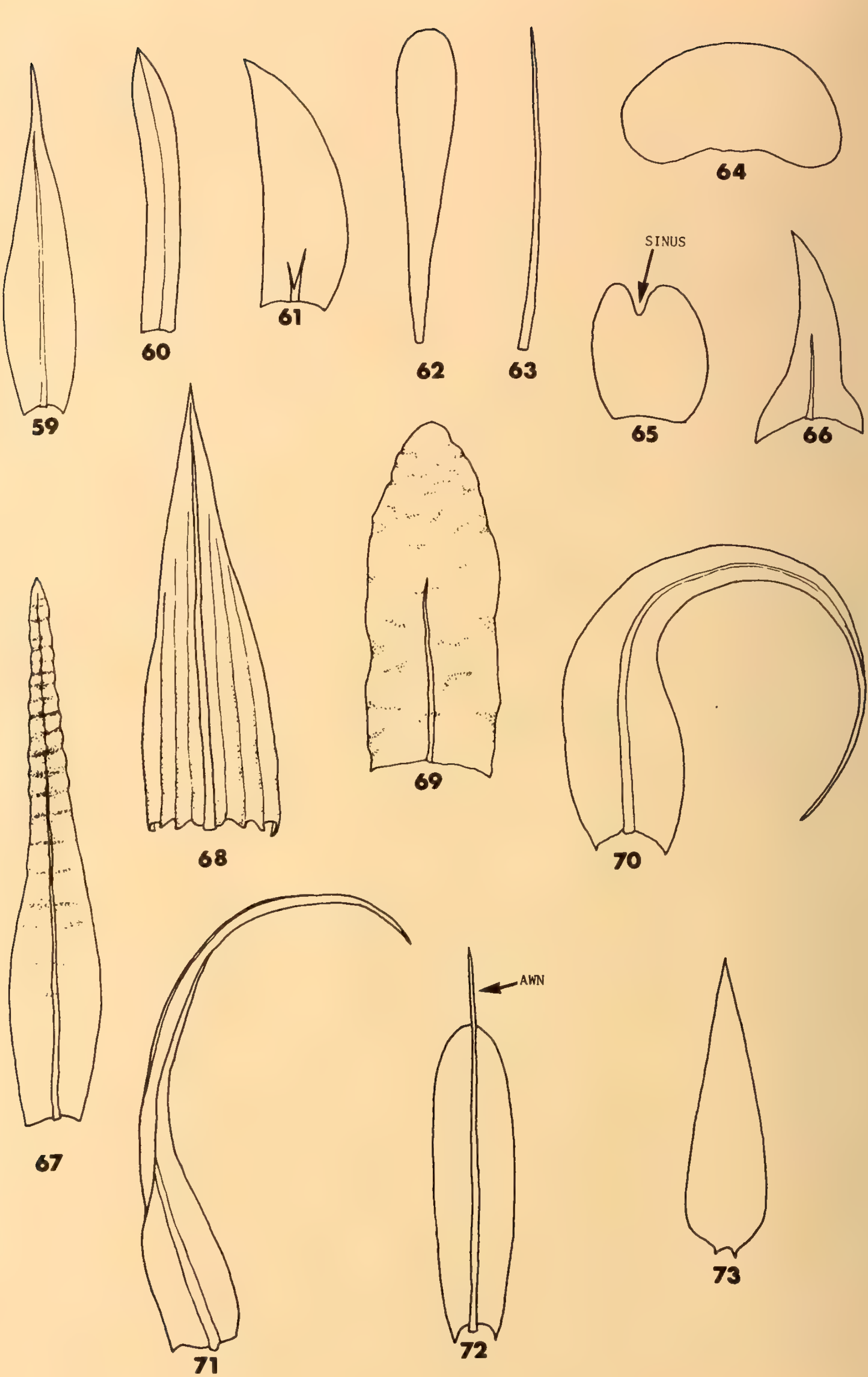

59
60
61
62
63
64
SINUS
65
66
67
68
69
70
71
AWN
72
73

Plate 404. **59.** Lanceolate. **60.** Ensiform. **61.** Cultriform, scalpelliform. **62.** Clavate. **63.** Acicular. **64.** Reniform. **65.** Bilobed. **66.** Hastate. **67.** Undulate. **68.** Plicate. **69.** Rugose. **70.** Circinate, gyrate, uncinate. **71.** Falcate. **72.** Aristate, piliferous. **73.** Ecostate, enervate.

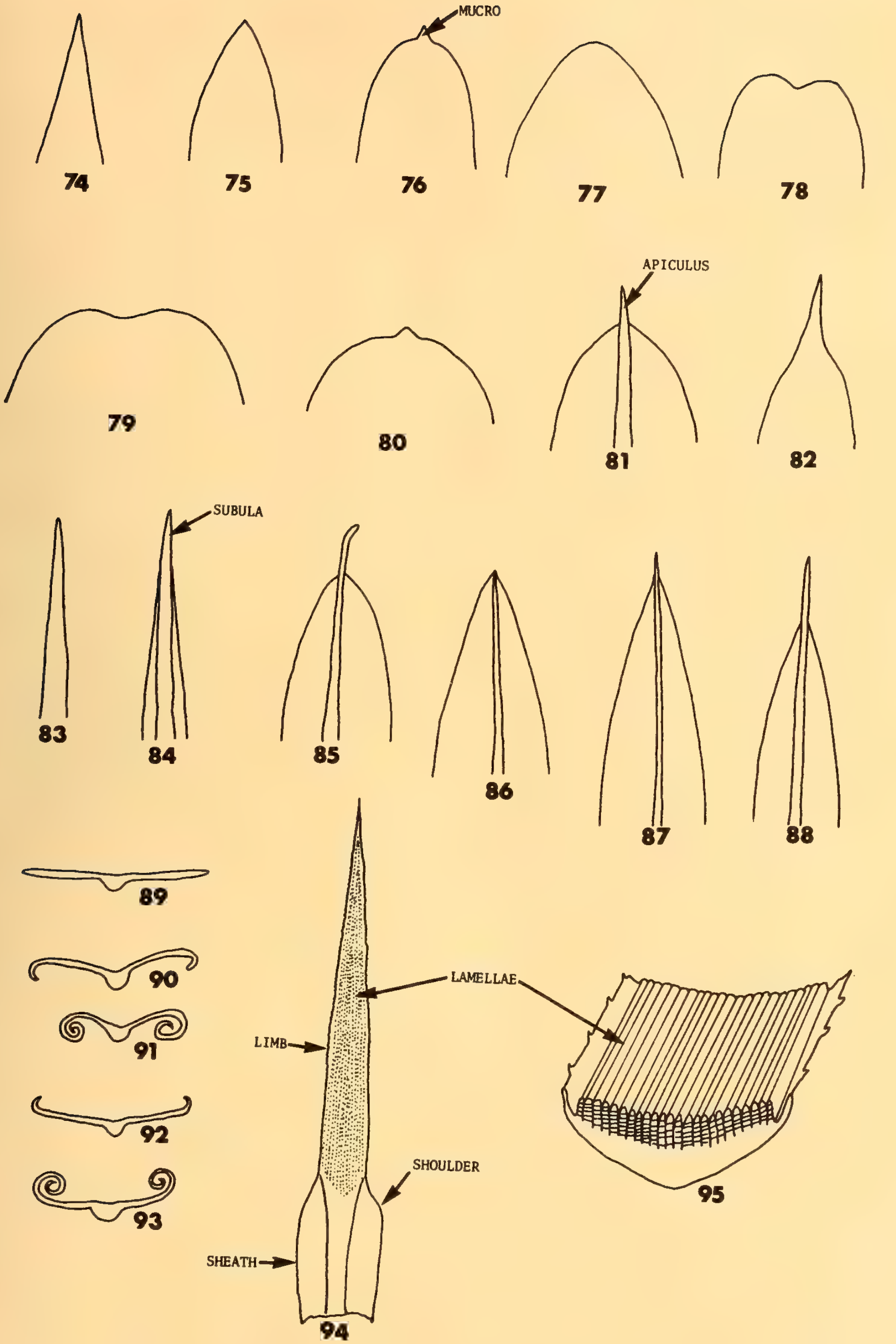

MUCRO
74
75
76
77
78
APICULUS
79
80
81
82
SUBULA
83
84
85
86
87
88
89
90
91
92
93
LAMELLAE
LIMB
SHOULDER
SHEATH
94
95

Plate 405. **74.** Acuminate. **75.** Acute. **76.** Mucronate. **77.** Obtuse. **78.** Emarginate. **79.** Retuse. **80.** Umbonate. **81.** Apiculate. **82.** Cuspidate. **83.** Setaceous. **84.** Subulate. **85.** Unguiculate. **86.** Percurrent. **87–88.** Excurrent. **89–93.** Cross-sections of leaves. **89.** Plane. **90.** Deflexed, recurved, reflexed. **91.** Revolute. **92.** Incurved, inflexed. **93.** Involute. **94.** Lamellae on *Polytrichum* leaf. **95.** Section of lamellae on *Polytrichum* leaf.

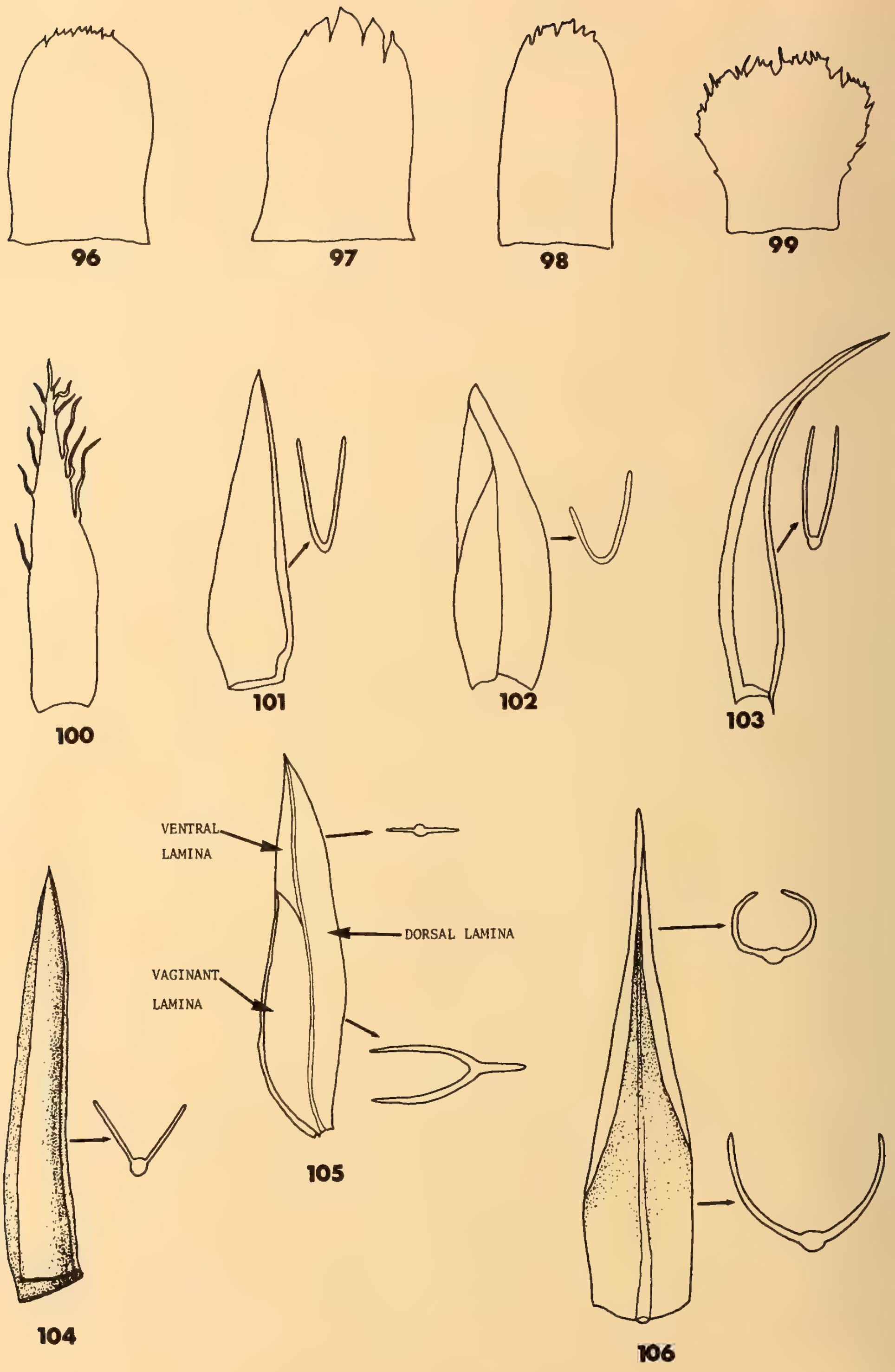

96
97
98
99
100
101
102
103
VENTRAL LAMINA
DORSAL LAMINA
VAGINANT LAMINA
104
105
106

Plate 406. **96.** Fimbriate. **97.** Incised. **98.** Erose. **99.** Lacerate. **100.** Ciliate. **101.** Conduplicate. **102.** Complicate. **103.** Complicate-carinate. **104.** Carinate, keeled. **105.** Equitant. **106.** Canaliculate, tubulose.

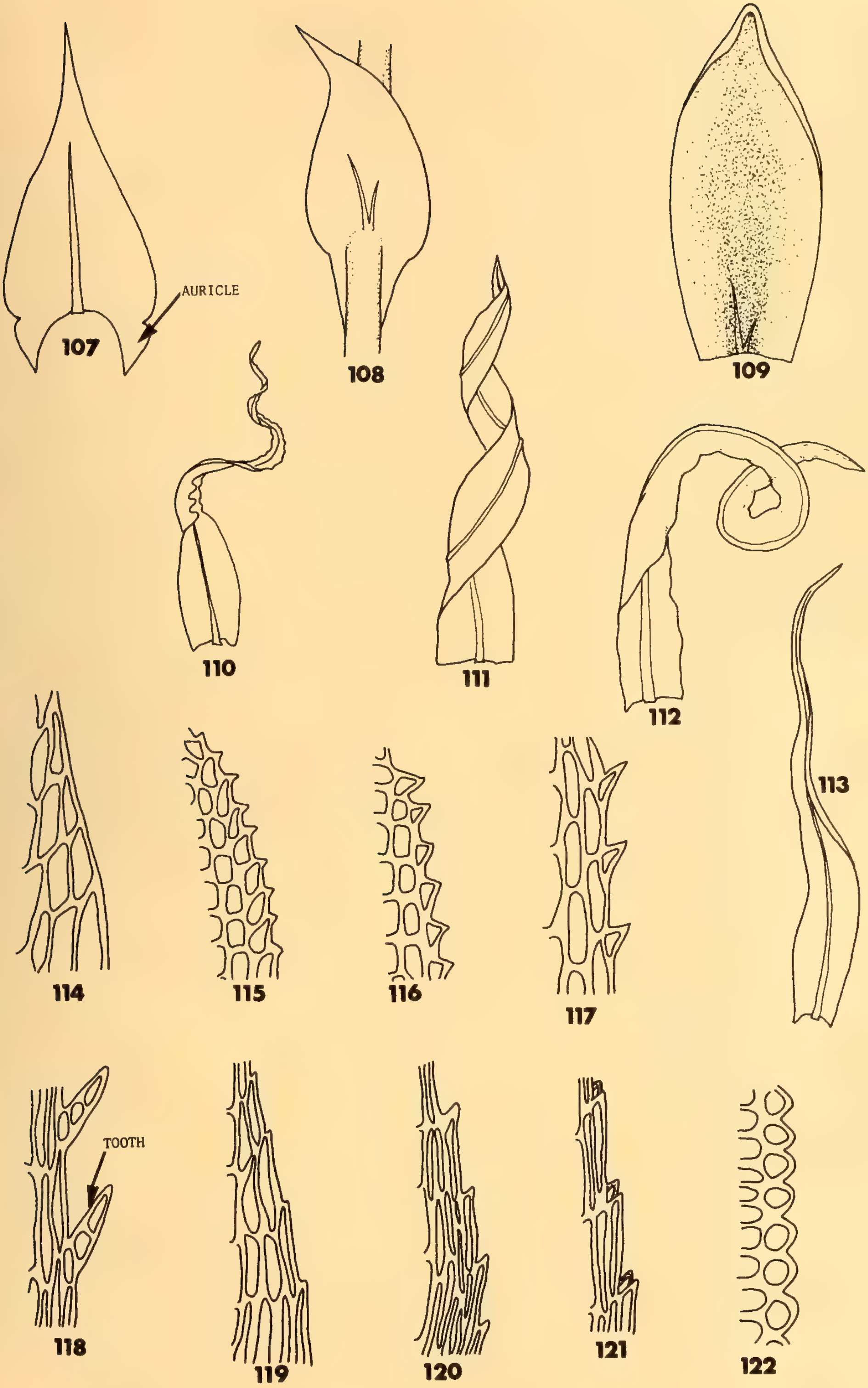
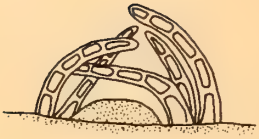

107
AURICLE
108
109
110
111
112
113
114
115
116
117
118
TOOTH
119
120
121
122

Plate 407. **107.** Auriculate. **108.** Decurrent. **109.** Cucullate. **110.** Tortuose. **111.** Helicoid. **112.** Cirrate, contorted, crisped. **113.** Flexuose. **114–122.** Leaf margins. **114.** Entire, edentate. **115.** Denticulate. **116.** Dentate. **117.** Spiculose. **118.** Spinose, toothed. **119.** Serrulate. **120.** Serrate. **121.** Doubly serrate. **122.** Crenate.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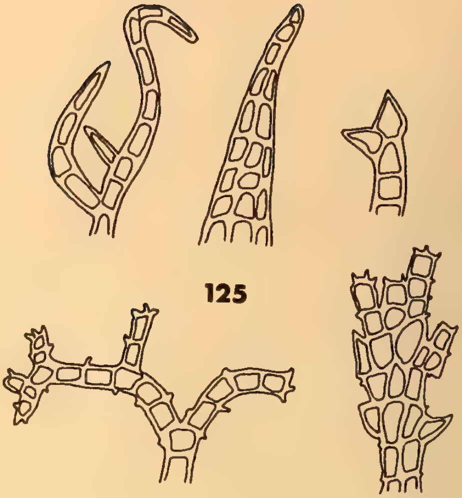
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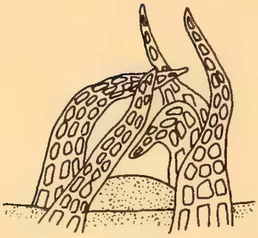
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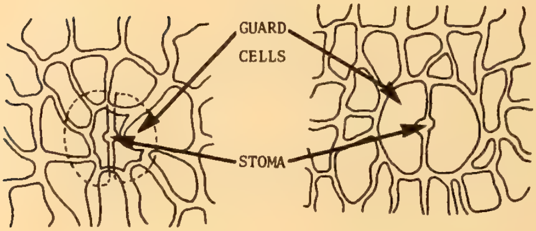
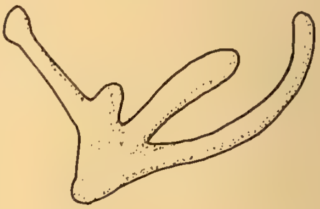

GUARD CELLS
STOMA
126

127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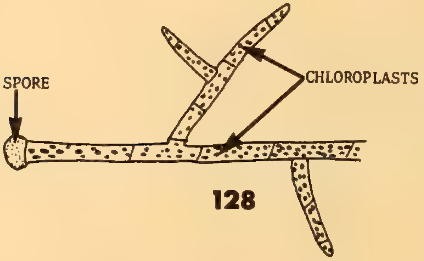
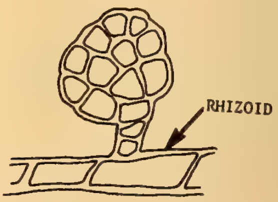

SPORE
CHLOROPLASTS
128



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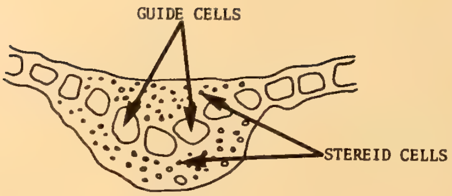

GUIDE CELLS
STEREID CELLS
130

Plate 408. **123–124.** Pseudoparaphyllia. **123.** Filamentose. **124.** Foliose. **125.** Paraphyllia, villi. **126–127.** Stomata. **126.** Cryptopore, immersed stoma. **127.** Phaneropore, superficial stoma. **128.** Filamentous protonema. **129.** Thallose. **130.** Cross-section of costa. **131.** Rhizoidal gemma, tuber.

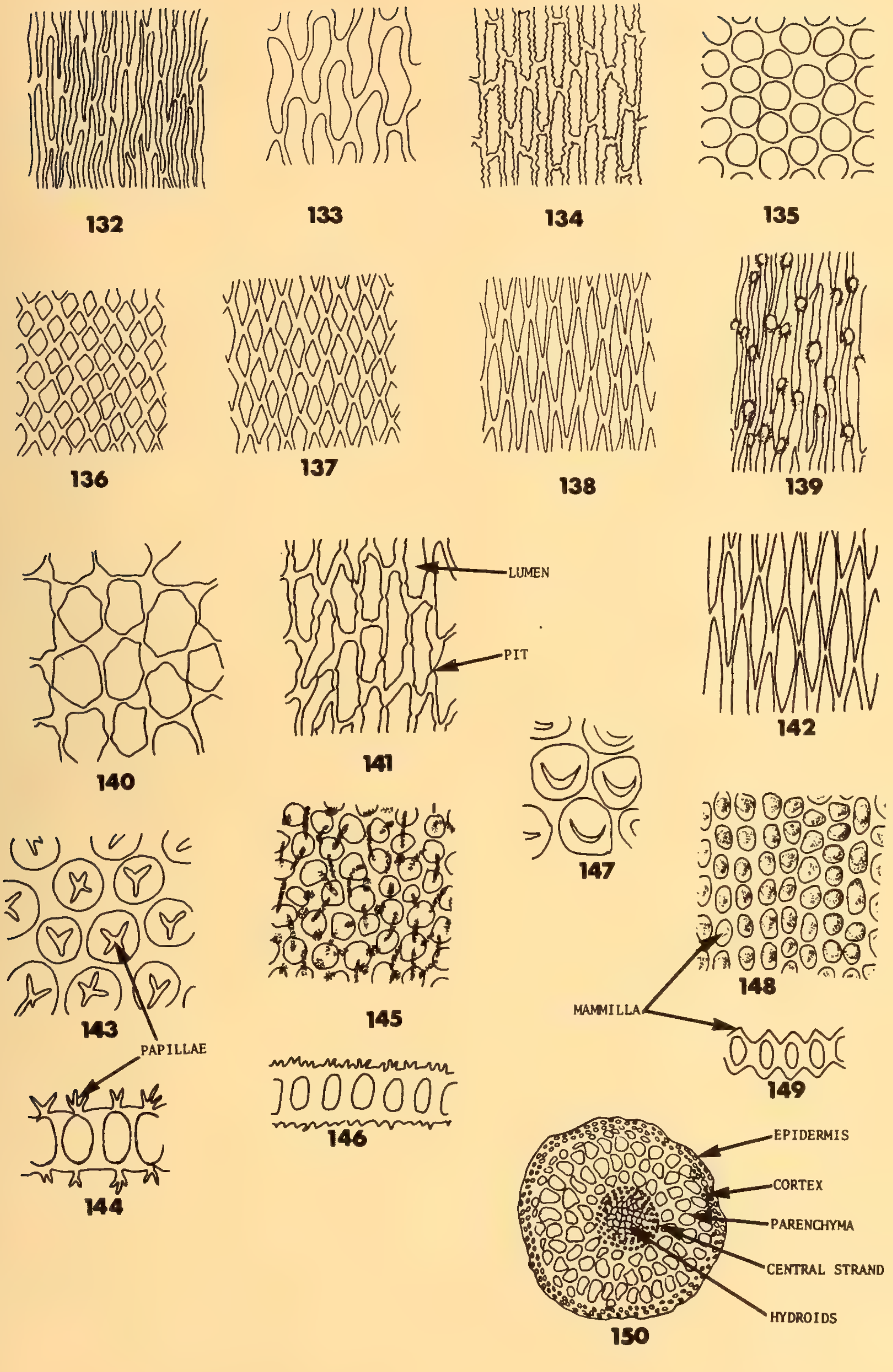
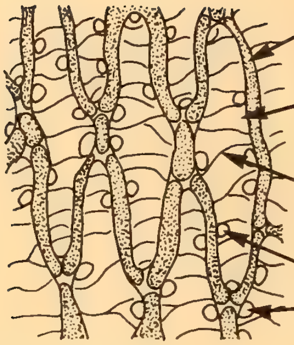
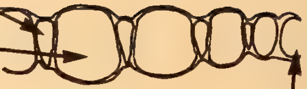

132
133
134
135
136
137
138
139
LUMEN
PIT
140
141
142
147
143
145
148
MAMMILLA
PAPILLAE
149
146
144
EPIDERMIS
CORTEX
PARENCHYMA
CENTRAL STRAND
HYDROIDS
150

Plate 409. **132.** Vermicular. **133.** Sigmoid. **134.** Sinuose. **135.** Isodiametric. **136.** Rhombic. **137.** Rhomboidal. **138.** Fusiform, spindle shaped. **139.** Prorate. **140.** Collenchymatous. **141.** Porose, pitted. **142.** Prosenchyma. **143.** Furcate papillae. **144.** Cross-section of cells with furcate papillae. **145.** Verrucose. **146.** Cross-section of verrucose leaf cells. **147.** Lunate papillae. **148.** Mammillose. **149.** Cross-section of mammillose cells. **150.** Cross-section of stem.


CHLOROCYST
HYALOCYST
(LEUCOCYST)
FIBRIL
PORES

151



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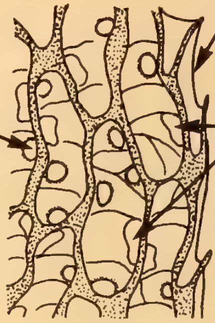
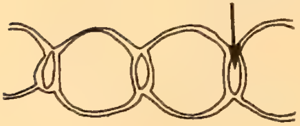
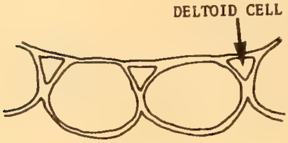

RESORPTION FURROW
MEMBRANE GAPS

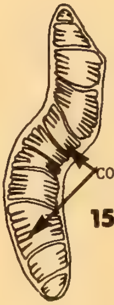
153


LENTICULAR CELL

154


DELTOID CELL

155


COMB FIBRILS

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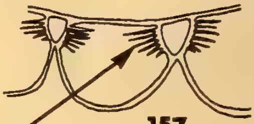

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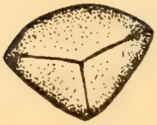

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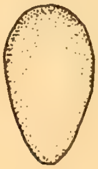

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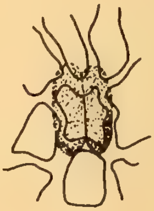

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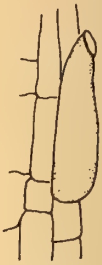

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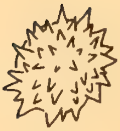

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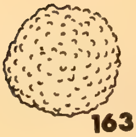

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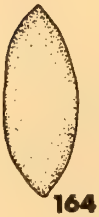

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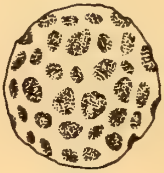

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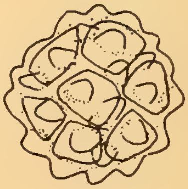

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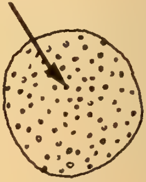


167

Plate 410. **151.** *Sphagnum* leaf cells. **152.** Cross-section of leaf margin of *Sphagnum*. **153.** Marginal leaf cells of *Sphagnum*. **154–155.** Cross-section of median leaf cells of *Sphagnum*. **156.** Comb fibrils of *Sphagnum* cell. **157.** Comb fibrils in cross-section of cell. **158.** Trilete spore. **159.** Ovoid. **160.** Pseudostoma. **161.** Retort cell. **162.** Echinate. **163.** Granulose. **164.** Ellipsoidal. **165.** Alveolate. **166.** Tuberculate. **167.** Foveolate.

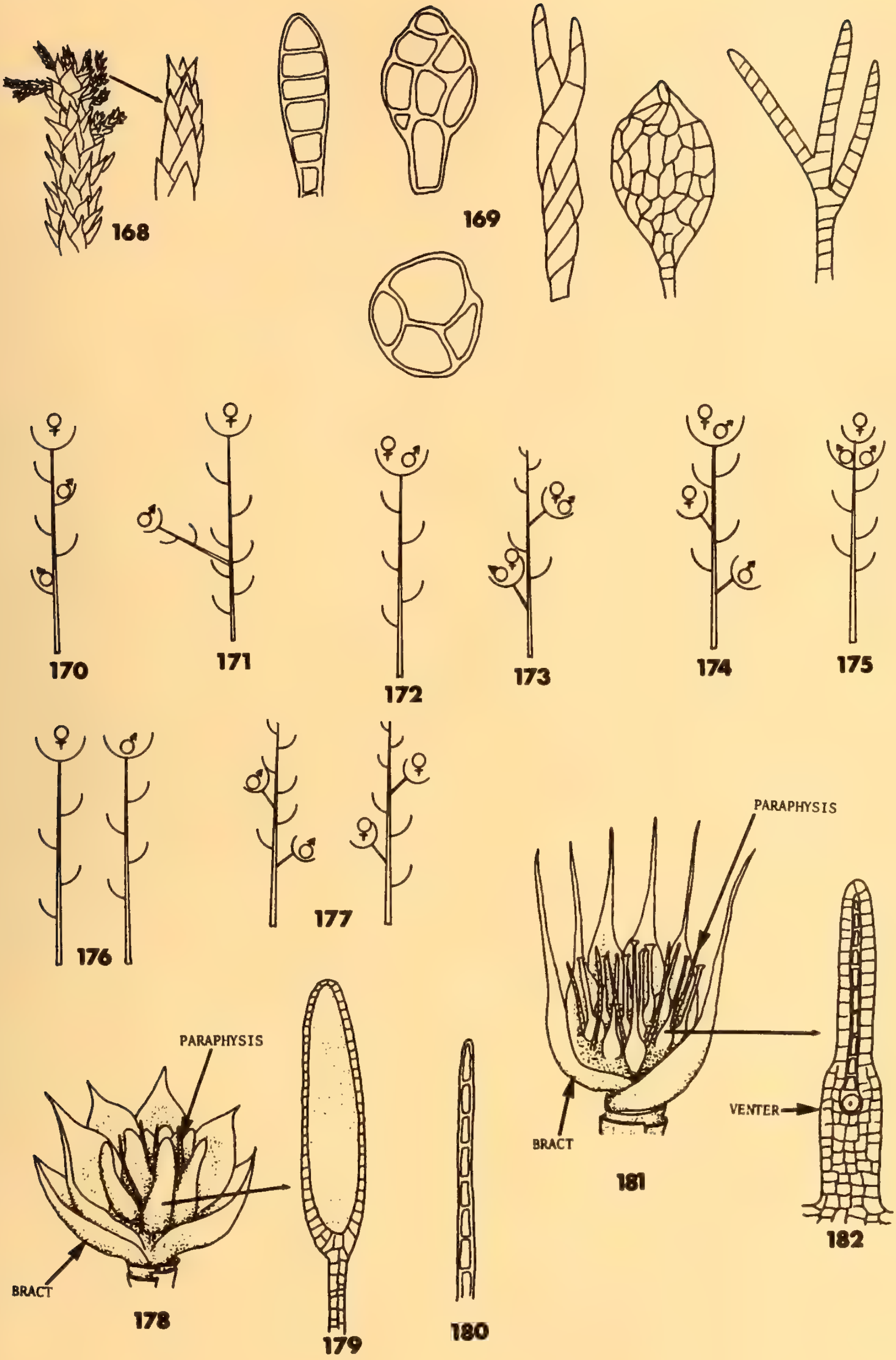

168
169
170
171
172
173
174
175
176
177
PARAPHYSIS
181
BRACT
VENTER
182
PARAPHYSIS
BRACT
178
179
180

Plate 411. **168–169.** Brood bodies. **168.** Brood branchlets. **169.** Gemmae. **170–175.** Monoicous. **170.** Autoicous: gonioautoicous. **171.** Autoicous: cladautoicous. **172–173.** Synoicous. **174.** Polygamous, polyoicous, heteroicous. **175.** Paroicous. **176–177.** Dioicous. **178.** Androecium, perigonial bud. **179.** Antheridium. **180.** Paraphysis. **181.** Gynoecium, perichaetial bud. **182.** Archegonium.

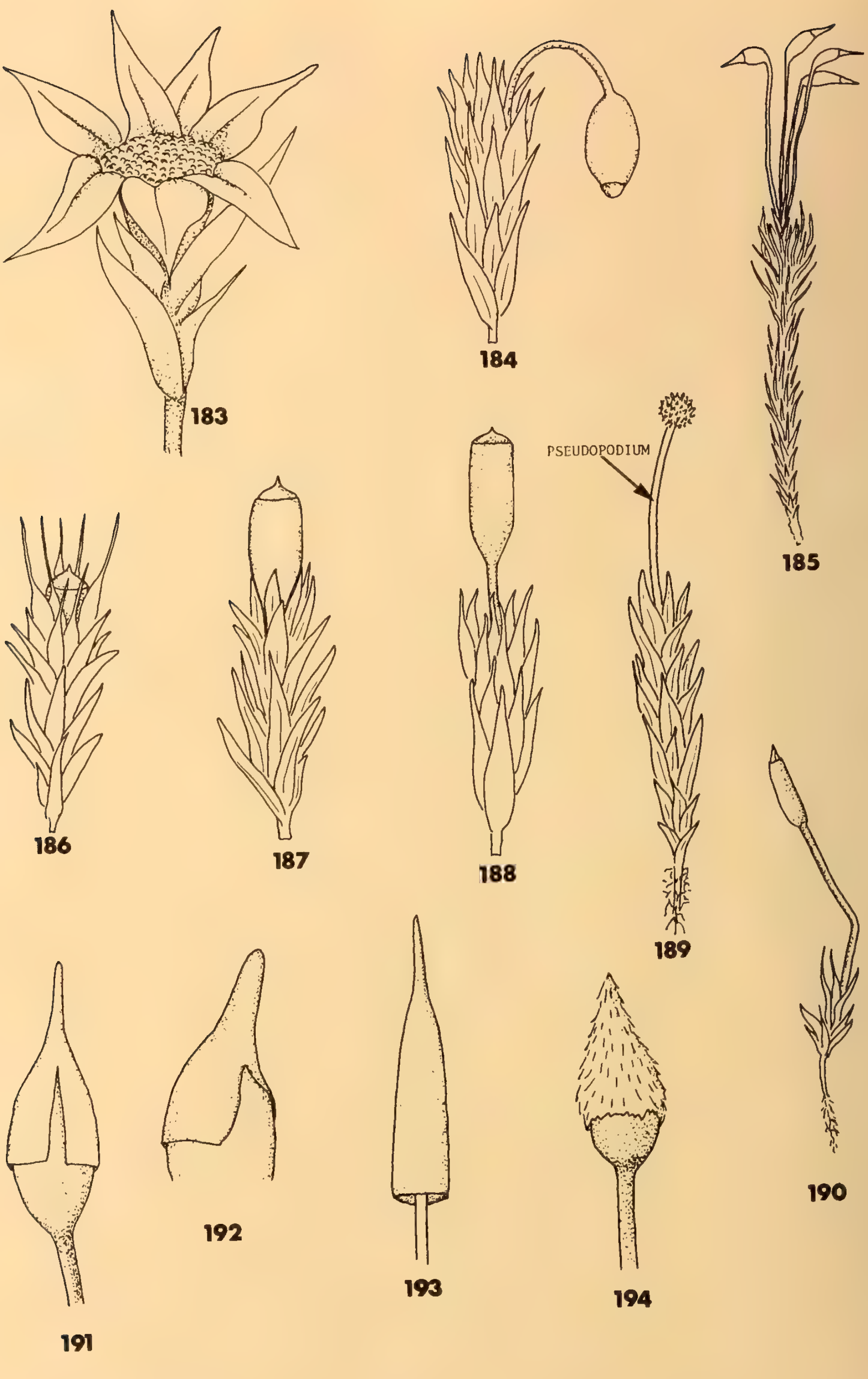

183
184
185
PSEUDOPODIUM
186
187
188
189
190
191
192
193
194

Plate 412. **183.** Discoid male inflorescence. **184.** Cygneous seta. **185.** Aggregate sporophytes. **186.** Immersed capsule. **187.** Emergent capsule. **188.** Exserted capsule. **189.** Pseudopodium. **190.** Geniculate seta. **191–194.** Calyptrae. **191.** Dimidiate. **192.** Cucullate. **193.** Mitrate. **194.** Hispid.

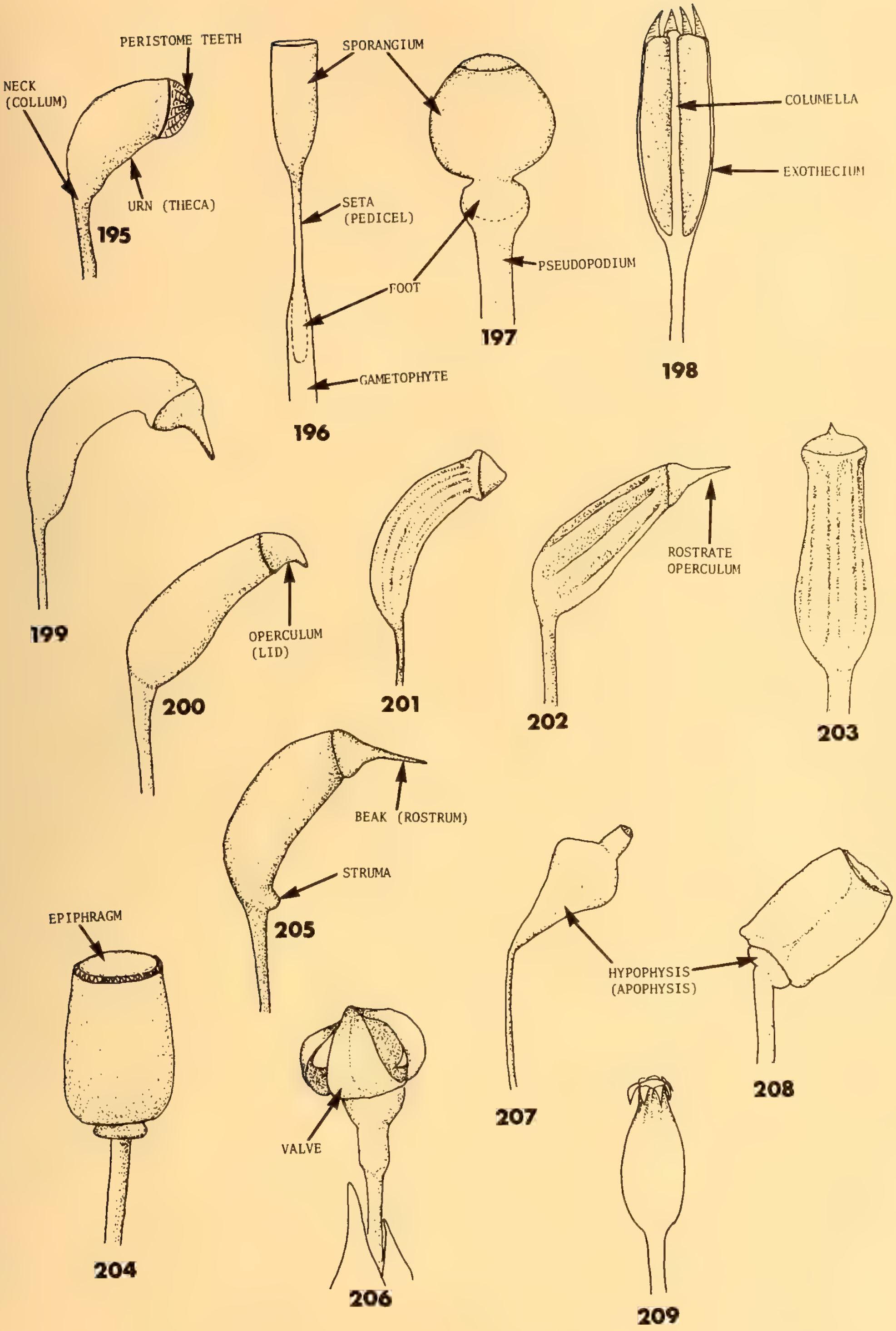
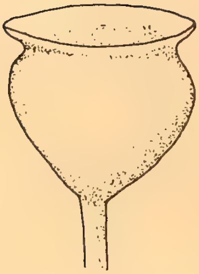

PERISTOME TEETH
NECK (COLLUM)
URN (THECA)
195
SPORANGIUM
SETA (PEDICEL)
FOOT
GAMETOPHYTE
196
PSEUDOPODIUM
197
COLUMELLA
EXOTHECIUM
198
199
OPERCULUM (LID)
200
201
ROSTRATE OPERCULUM
202
203
BEAK (ROSTRUM)
STRUMA
205
EPIPHRAGM
204
VALVE
206
HYPOPHYSIS (APOPHYSIS)
207
208
209

Plate 413. **195.** Capsule. **196–197.** Sporophyte. **198.** Columella (seen in longitudinal section of capsule). **199–209.** Capsules. **199.** Arcuate. **200.** Inclined. **201.** Striate. **202.** Sulcate. **203.** Ribbed. **204.** Epiphragm of Polytrichaceae capsule. **205.** Strumose. **206.** Valves of *Andreaea* capsule. **207.** Hypophysis of *Splachnum* capsule. **208.** Hypophysis of *Polytrichum* capsule. **209.** Coarctate, constricted, strangulate.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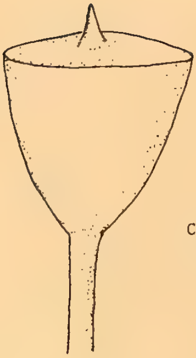
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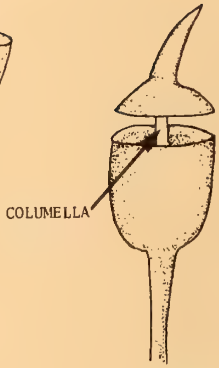

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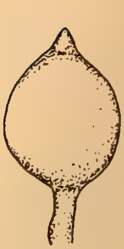
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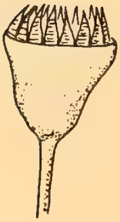
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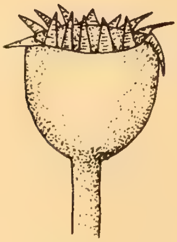
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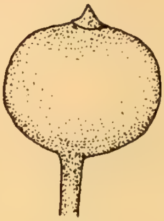
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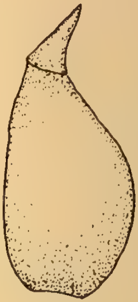
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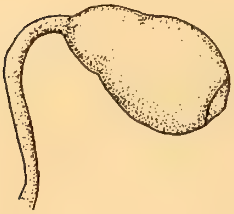
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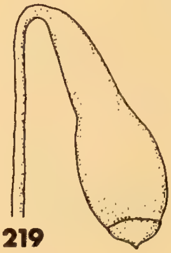
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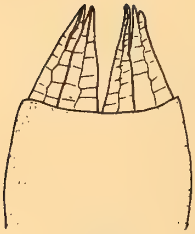
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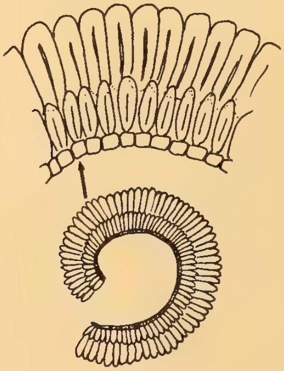
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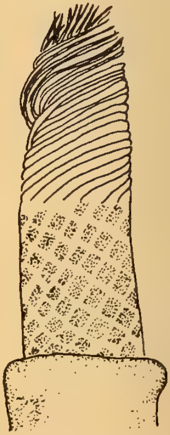
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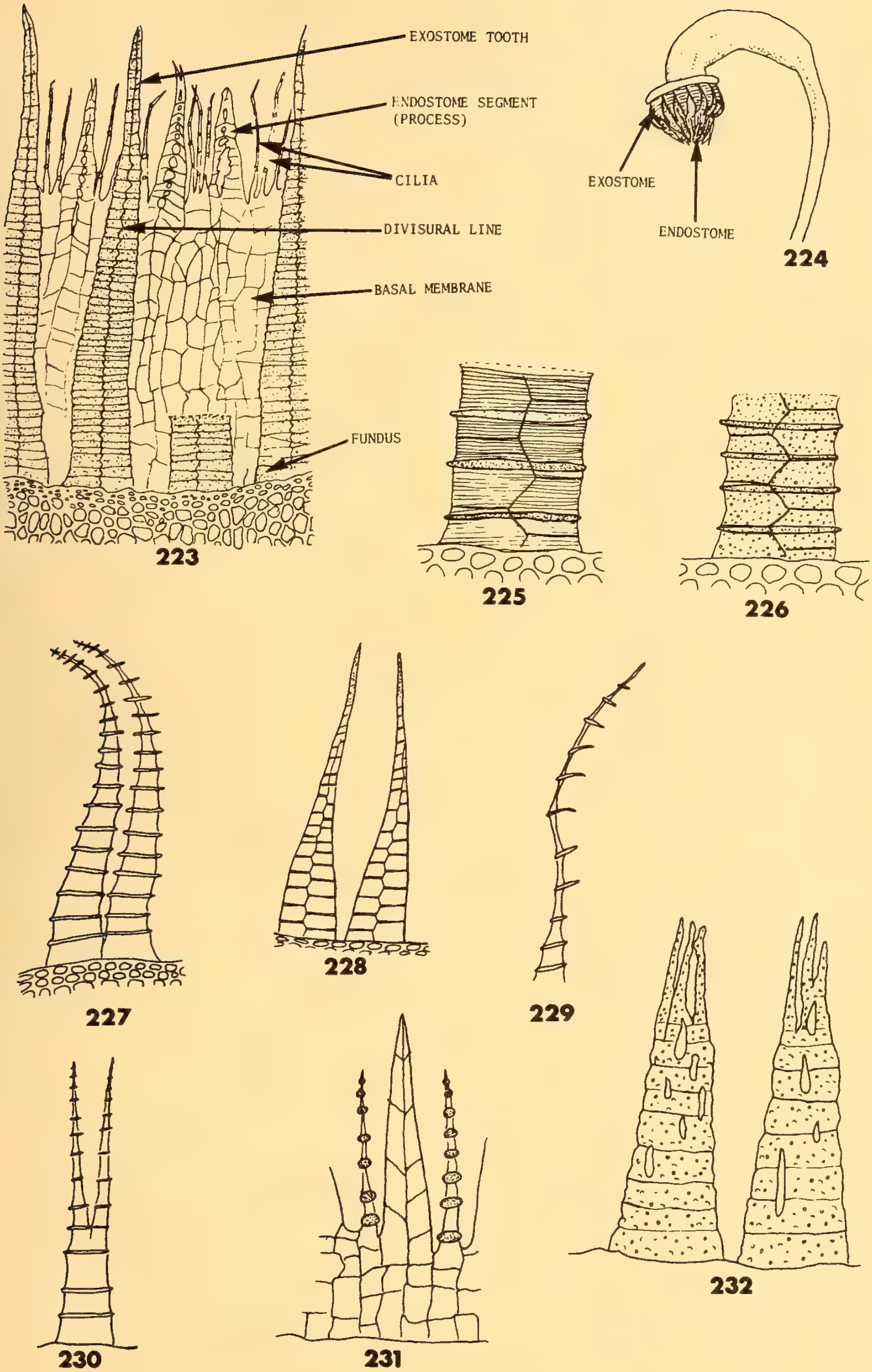
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Literature Cited

Ahti, T. and P. Isoviita. 1962. *Dicranum leioneuron* Kindb. and the other *Dicranum* mosses inhabiting raised bogs in Finland. Arch. Soc. Zool. Bot. Fenn. "Vanamo" 17(2): 68–79.

Anderson, L.E. 1954. Hoyer's solution as a rapid permanent mounting medium for bryophytes. The Bryologist 57(3): 242–244.

Anderson, L.E. and V.S. Bryan. 1956. A cyto-taxonomic investigation of *Fissidens cristatus* Wils. and *F. adiantoides* Hedw. in North America. Rev. Bryol. et Lichén. 25(3–4): 254–267.

1958. Systematics of the autoicous species of *Ditrichum* Subg. *Ditrichum*. Brittonia 10(3): 121–137.

Ando, H. 1972. Studies on the genus *Hypnum* Hedw. (I). J. Sci. Hiroshima Univ. Ser. B, Div. 2, 14(2): 53–73.

1973. Studies on the genus *Hypnum* Hedw. (II). J. Sci. Hiroshima Univ. Ser. B, Div. 2, 14(3): 165–207.

1976. Studies on the genus *Hypnum* Hedw. (III). J. Sci. Hiroshima Univ. Ser. B, Div. 2, 16(1): 1–46.

Andrus, R.E. 1980a. *Sphagnum subtile* (Russow) Warnst. and allied species in North America. Systematic Botany 4(4): 351–362. [1979]

1980b. Sphagnaceae (peat moss family) of New York state. Contributions to a flora of New York State III. N.Y. State Museum Bull. 422: 89 pp.

Anonymous. 1898. New American mosses. The Bryologist 1(3): 67–68.

Barnes, C.R. 1896. Analytic keys to the genera and species of North American mosses. Bull. Univ. Wisconsin (Sci. Ser.) 1(5): 157–368.

Bartram, E.B. 1922. Some Nova Scotia mosses. Rhodora 24: 121–124.

Bremer, B. 1980a. Proposal to reject the names *Grimmia alpicola* Sw. *ex* Hedw. and *Schistidium alpicola* (Sw. *ex* Hedw.) Limpr. (Grimmiaceae). Taxon 29(2/3): 337–339.

1980b. A taxonomic revision of *Schistidium* (Grimmiaceae, Bryophyta) 1. Lindbergia 6: 1–16; 2. Lindbergia 6: 89–117.

Britton, E.G. 1896. The humpbacked elves. The Observer 7(3): 105–113.

Brodie, H.J. 1951. The splash-cup dispersal mechanism in plants. Can. J. Bot. 29: 224–234.

Brotherus, V.F. 1924–25. *In* A. Engler and K. Prantl, eds., Die natürlichen Pflanzenfamilien, Ed. 2, Vols. 10–11. Leipzig.

Brown, M.M. 1919. The development of the gametophyte and the distribution of sexual characters in *Funaria hygrometrica* (L.) Schreb. Amer. J. Bot. 6: 387–400.

Brown, M.S. 1929. Bryophytes of Nova Scotia. Additional List. The Bryologist 32(3): 50–56.

1936a. Bryophytes of Nova Scotia: Additions to date of Jan. 1936. The Bryologist 39(6): 124–126.

1936b. Liverworts and mosses of Nova Scotia. Proc. Nova Scotian Inst. Sci. 19(2): 161–198.

1946. Bryophytes of Nova Scotia: Addition to July, 1945. The Bryologist 49(3): 102–103.

1951. Bryophytes of Nova Scotia: Additional List. The Bryologist 54(3): 209–213.

Buck, W.R. 1980. A generic revision of the Entodontaceae. J. Hattori Bot. Lab. 48: 71–159.

Crum, H.A. 1954. Additions to the moss flora of Kentucky. Trans. Kentucky Acad. Sci. 15(1–2): 24–26.

1966. A taxonomic account of the genus *Thelia*. Nat. Mus. Can. Bull. 216, Contr. Bot. IV, 123–127.

1976. Mosses of the Great Lakes Forest. 404 pp. Revised Ed. Univ. of Michigan Herb., Ann Arbor.

Crum, H.A. and L.E. Anderson. 1964. Notes on *Physcomitrium collenchymatum*. The Bryologist 67(3): 350–355.

1981. Mosses of eastern North America. 2 Vols., 1328 pp. Columbia University Press, New York.

Crum, H.A., W.C. Steere, and L.E. Anderson. 1973. A new list of mosses of North America north of Mexico. The Bryologist 76(1): 85–130.

Crundwell, A.C. 1970. Notes on the nomenclature of British mosses. I. Trans. Brit. Bryol. Soc. 6(1): 133–138.

Crundwell, A.C. 1979. Rhizoids and moss taxonomy. Bryophyte Systematics, Ed. G.C.S. Clarke and J.G. Duckett, Vol. 14, pp. 347–363. Academic Press, New York.

Crundwell, A.C. and E. Nyholm. 1964. The European species of the *Bryum erythrocarpum* complex. Trans. Brit. Bryol. Soc. 4(4): 597–637.

Damman, A.W.H. and J.D. Dowhan. 1981. Vegetation and habitat conditions in Western Head Bog, a southern Nova Scotian plateau bog. Can. J. Bot. 59(7): 1343–1359.

Delgadillo M., C. 1975. Taxonomic revision of *Aloina, Aloinella* and *Crossidium* (Musci). The Bryologist 78(3): 245–303.

Edwards, S.R. 1978. Protonemal gemmae in *Schistostega pennata* (Hedw.) Web. *ex* Mohr. J. Bryology 10(1): 69–72.

Erskine, J.S. 1947. Minute mosses of Windsor, Nova Scotia. The Bryologist 50(3): 276–278.

1950. More minute mosses in Nova Scotia. The Bryologist 53(1): 54–56.

1953. New bryophytes in Nova Scotia. The Bryologist 56(3): 177–179.

1968. An introductory moss flora of Nova Scotia. Nova Scotia Museum, Occasional Paper 6, Sci. Ser. 4, 110 pp.

Flowers, S. 1973. Mosses: Utah and the West. 567 pp. Brigham Young Univ. Press, Provo.

Fowler, J. 1879. List of New Brunswick plants. Report of the Secretary for Agriculture. Appendix B, pp. 59–62.

1880. Additions to the list of New Brunswick plants. Report of the Secretary for Agriculture. pp. 7–8.

Grout, A.J. 1922. *Brachythecium* notes. The Bryologist 25(1): 13–14.

1928–34. Moss flora of North America, north of Mexico. Vol. 3, 268 pp. Published by the author, New York and Newfane.

1933–40. Moss flora of North America, north of Mexico. Vol. 2, 273 pp. Published by the author, Newfane.

1936–39. Moss flora of North America, north of Mexico. Vol. 1, 253 pp. Published by the author, Newfane.

Habeeb, H. 1943. Notes on the moss flora of New Brunswick. I. Acadian Nat. 1(2): 70–74.

1944a. Notes on the moss flora of New Brunswick. II. Acadian Nat. 1(3): 127–134.

1944b. Notes on the moss flora of New Brunswick. III. Acadian Nat. 1(4): 187–191.

1944c. Musci Novi Brunsvici Fascicule II. Acadian Nat. 1(4): 172.

1945. Notes on the moss flora of New Brunswick. IV. Acadian Nat. 2(5): 47–51.

1946. Some mosses from Windsor, Nova Scotia. Rhodora 48: 1–4.

1950. Nomenclatural and other notes on mosses. Rhodora 52: 72–75.

1952. Nomenclatural and other notes on mosses. II. Rhodora 54: 156–158.

Horton, D.G. and D.H. Vitt. 1976. Morphological characters, relative to distribution, and taxonomic considerations of the genus *Climacium* in North America. Can. J. Bot. 54(16): 1872–1883.

Ireland, R.R. 1969a. Taxonomic studies on the genus *Atrichum* in North America. Can. J. Bot. 47(3): 353–368.

1969b. A taxonomic revision of the genus *Plagiothecium* for North America, north of Mexico. Nat. Mus. Can., Nat. Mus. Natural Sci., Publ. Bot. 1: 118 pp.

1978. *Trichodon* in North America. The Bryologist 81(1): 150–154.

Ireland, R.R., C.D. Bird, G.R. Brassard, W.B. Schofield and D.H. Vitt. 1980. Checklist of the mosses of Canada. Nat. Mus. Can., Nat. Mus. Natural Sci., Publ. Bot. 8: 75 pp.

Iwatsuki, Z. and T. Koponen. 1972. On the taxonomy and distribution of *Rhodobryum roseum* and its related species (Bryophyta). Acta Bot. Fennica 96: 1–22.

Karczmarz, K. 1971. A monograph of the genus *Calliergon* (Sull.) Kindb. Polskie Towarzystwo Botaniczne, Monographiae Botanicae. Vol. 34. Warsaw. 209 pp.

Kindberg, N.C. 1893. Notes on Canadian Bryology. The Ottawa Naturalist 7: 17–23.

Koponen, T. 1971. *Rhytidiadelphus japonicus* and *R. subpinnatus.* Hikobia 6(1–2): 18–35.

1973. *Rhizomnium* (Mniaceae) in North America. Ann. Bot. Fennici 10: 1–26.

1974. A guide to the Mniaceae in Canada. Lindbergia 2(3–4): 160–184.

Lawton, E. 1957. A revision of the genus *Lescuraea* in Europe and North America. Bull. Torrey Bot. Club 84(4): 281–301, (5): 337–355.

1971. Moss flora of the Pacific Northwest. Hattori Botanical Laboratory. 362 pp. Nichinan, Japan.

Lesquereux, L. & T.P. James. 1884. Manual of the mosses of North America. 447 pp. S.E. Casino, Boston.

Lewis, K. and A.J.E. Smith. 1977. Studies on some bulbiliferous species of *Pohlia* section *Pohliella*. I. Experimental investigations. J. Bryology 9(4): 539–556.

1978. Studies on some bulbiliferous species of *Pohlia* section *Pohliella*. II. Taxonomy. J. Bryology 10(1): 9–27.

Loucks, O.L. 1962. A forest classification for the Maritime Provinces. Proc. N.S. Institute Sci. 25(2): 86–167.

Maass, W.S.G. 1967. Studies on the taxonomy and distribution of *Sphagnum* II. *Sphagnum angermanicum* Melin in North America and its relation to allied species. Nova Hedwigia 13(3–4): 449–467.

Macoun, J. 1902. Catalogue of Canadian plants. pp. 181–318. (Addendum to pt. 6) *in* pt. 7. Lichenes and Hepaticae. Geol. Surv. of Can., Ottawa.

Macoun, J. and N.C. Kindberg. 1892. Catalogue of Canadian plants. 295 pp., pt. 6, Musci. Geol. Surv. of Can., Ottawa.

Miller, N.G. and R.R. Ireland. 1979. *Timmia austriaca* (Musci: Timmiaceae) in North America. The Bryologist 81(4): 577–581. [1978]

Müller, H. 1924. A revision of the new species and varieties of *Philonotis* described by N.C. Kindberg from North America. The Bryologist 27(5): 74–77.

Moser, J. and G.U. Hay. 1898. List of mosses of New Brunswick. Nat. History Soc. New Brunswick, Bull. 16: 23–31.

Nichols, G.E. 1916. The bryophytes of Nova Scotia, with special reference to Cape Breton. The Bryologist 19(3): 38–47.

1918. Additions to the list of bryophytes from Cape Breton. The Bryologist 21(2): 28–29.

Nyholm, E. 1971. Studies in the genus *Atrichum* P. Beauv. A short survey of the genus and the species. Lindbergia 1(1–2): 1–33.

Peterson, W. 1977a. *Dicranum ontariense* Peterson: a new name for a North American endemic moss. Can. J. Bot. 55(8): 986–991.

1977b. Clarification of the nomenclature of *Dicranum condensatum*. The Bryologist 80(2): 365–368.

Pursell, R.A. 1976. On the typification of certain taxa and structural variation within the *Fissidens bryoides* complex in eastern North America. The Bryologist 79(1): 35–41.

Roland, A.E. and E.C. Smith. 1969. The flora of Nova Scotia. Proc. Nova Scotian Inst. Sci. 26: 5–238, 278–743.

Savich-Liubitskaia, L.I. and Z.M. Smirnova. 1970. The handbook of the mosses of the U.S.S.R. 824 pp. Leningrad.

Schnooberger, I. 1942. Distribution of *Tortula papillosa* Wils. The Bryologist 45(1): 24–27.

Scoggan, H.J. 1978. The flora of Canada. Part 1. General Survey. Nat. Mus. Can., Nat. Mus. Natural Sci., Publ. Bot. 7(1): 89 pp.

Smith, A.J.E. 1973. On the differences between *Bryum creberrimum* Tayl. and *B. pallescens* Schleich. *ex* Schwaegr. J. Bryology 7(3): 333–337.

1978. The moss flora of Britain and Ireland. 706 pp. Cambridge University Press, Cambridge.

Syed, H. 1973. A taxonomic study of *Bryum capillare* Hedw. and related species. J. Bryology 7(3): 265–326.

Tuomikoski, R., T. Koponen and T. Ahti. 1973. The mosses of the island of Newfoundland. Ann. Bot. Fennici 10: 217–264.

Vitt, D.H. 1972. A monograph of the genus *Drummondia*. Can. J. Bot. 50(6): 1191–1208.

1973a. A revision of the genus *Orthotrichum* in North America, north of Mexico. Bryophytorum Bibliotheca Vol. 1, 208 pp.

1973b. Distributional studies on bryophytes of Alberta. The Bryologist 76(4): 505–510.

1976. The genus *Seligeria* in North America. Lindbergia 3(3–4): 241–275.

Vitt, D.H. and C.D. Hamilton. 1975. Taxonomic status of *Tomenthypnum falcifolium*. The Bryologist 78(2): 168–177.

Warnstorf, C. 1911. Das Pflanzenreich, Regni vegetabilis conspectus. Sphagnales – Sphagnaceae. Im Auftrage der Königl. preuss. Akademie der Wissenschaften von A. Engler. Vol. 51, 546 pp.

Welch, W.H. 1960. A monograph of the Fontinalaceae. 357 pp. M. Nijhoff, The Hague.

Whitehouse, H.L.K. 1966. The occurrence of tubers in European mosses. Trans. Brit. Bryol. Soc. 5(1): 103–116.

1976. *Ditrichum pusillum* (Hedw.) Britt. in arable fields. J. Bryology 9(1): 7–11.

Wynne, F.E. 1944. Studies in *Drepanocladus*. IV. Taxonomy. The Bryologist 47(4): 147–189.

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